Farming Systems Research and Spirituality

an analysis of the foundations of professionalism in developing sustainable farming systems

Toon van Eijk

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This thesis is dedicated to all rural women in Mozambique, Kenya, Tanzania and Zambia who work 10-12 hours per day and are the backbone of agriculture

CONTENTS

Abstract

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Additional keywords: scientific paradigms, positivism, constructivism, transcendentalism, holism, interdisciplinarity, attitudes, countervailing power, actor-structure debate, consciousness development, internalization, intuition.

The gap between FSR theory and its actual practice results in the main research question of this study: '*why is it so difficult to improve the ability of FSR teams to develop sustainable farming systems*'. FSR theory makes sense, although conceptual confusion continues to plague the 'fuzzy' FSR concept. Farming as 'a way of life' demands a farming systems perspective, which is at odds with the ever-continuing specialization in agricultural research. The practicability of the comprehensive FSR concept remains problematic, which shows up in a long list of operational problems. These problems have been centered around four main issues: holism, interdisciplinarity, attitudinal factors, and lack of countervailing power. A holistic approach to the development of sustainable farming systems demands recognition of the multi-dimensionality of the development process (synergy in the mix is required), and internalization of a farming systems perspective. A simultaneously holistic and pragmatic FSR approach demands *high quality collective agency* with the multitude of actors in the rural development process.

In the field of agriculture the holistic-organismic philosophy of nature, together with Koestler's Janus-faced holons, seems an appropriate alternative to the positivist point of view. The holon symbolizes the missing link between reductionism and holism. In order to go beyond integration in retrospect of sub-solutions developed by disciplinary scientists, and to preserve the irreducible integrity of the farming systems perspective, the 'art, craft and science' of agronomy must be (re)established. Holistic performance, interdisciplinarity and synergy emerge with a dynamic equilibrium of self-assertive and integrative tendencies. The holistic argument that 'the whole is more than the sum of its parts' has a certain 'elusive' connotation. The *emerging* synergetic effect of interaction can be puzzling.

Contemporary FSR must be positioned somewhere at the point of overlap between the positivist and constructivist paradigms. Both these paradigms are grounded in a continual identification with the rational-empirical consciousness, i.e., in *thinking*-being. Spirituality is in this study defined as the process in which one *systematically* trains the receptivity to gain *regular* access to transcendental consciousness. Instead of only *thinking*-being, the experience of just *being*, of *consciousness-as-such* (transcendental consciousness) is emphasized. Spirituality is here understood as an individual, free, anarchistic, horizontal and above all *experiential* spirituality, which is not based on dogmas, but on do-it-yourself techniques to break the continuous spell of the rational-empirical consciousness. Spirituality refers to the original meaning of religion, i.e., *religare, religio*: to (re)connect to the field of transcendental consciousness. The domain of spirituality is open to investigation by the scientific method, i.e., open to *experiential* validation or refutation. A common

category error is to confuse thinking and talking about the spiritual domain (paradoxical reason) with direct, non-mediated *experience* of this realm.
Scientific research on the effects of the Transcendental Meditation technique strongly suggests that the quality of life in society is influenced by the *quality* of the collective consciousness, i.e., the coherence, and the degree of enlivenment of transcendental consciousness, in this collective consciousness. A ‘high quality’ collective consciousness displays an ‘orchestrating’ quality by virtue of its holistic field effect. A ‘high quality’ individual and collective consciousness *facilitates* the cultivation of societally and environmentally friendly behavior. Access to transcendental consciousness, however, does not automatically result in effective action in the domain of existence. Relevant knowledge and practical skills are also necessary. *Experiential* spirituality can guide the application of such knowledge and skills in a societally and environmentally friendly direction.

The transcendentalist paradigm is characterized by consciousness-mediated manageability: holistic, non-local effects are (presumably) mediated through the ‘orchestrating’ agency of the field of transcendental consciousness. In addition to mediation by verbal communication in direct social interaction -as practised in, for example, soft systems thinking- mediation of behavioral effects at a distance through consciousness seems possible. Although scientific research on the field *effect* of consciousness provides only *indirect* evidence for the existence of the consciousness factors, the *replicability* and *predictability* of this effect is so persuasive that it certainly warrants further attention from scientists. It is (supposedly) the agency of the field of transcendental consciousness which facilitates the ‘management’ of the multiple aspects of sustainable development. Sustainability is an integrative, holistic property which encompasses ‘wholeness in human beings’ and ‘wholeness in society’. Sustainability can be defined as the ‘emergent property’ of experiential spirituality and rational morality based on negotiated agreements. In addition to the outward-oriented approaches of the positivist and constructivist paradigms, I recommend an inward-oriented approach which focuses on consciousness development.

The attunement of hard, soft and critical systems *thinking* is not hindered so much by the difference between hard, soft and critical as by their common element, i.e., the reliance on *thinking*-being as the only possible mode of being. Also conventional FSR suffers from this ‘illusion of intellectual holism’. In a similar vein as there is no simple positivist ‘techno-fix’ or a constructivist-inspired ‘participation-fix’ in resource-poor farming, there is also no transcendentalist ‘consciousness-mediated fix’. Consciousness development is not an overnight solution: it takes time, and positivist- and constructivist-oriented methodologies remain indispensable. To my mind, however, language-mediated interaction must be supported by consciousness-mediated interaction. Trans-disciplinarity entails that farm-household members, specialists, and generalists study farming systems from their respective points of view, while they maintain transcendental consciousness in their awareness. It involves an integration of scientific reflection and spiritual experience.

Preface and acknowledgements

For a discussion of my main motive to write a thesis I refer to the epilogue at the end of this study (chapter 14) and to chapter 1. Some readers might want to read first the epilogue, and only then embark on the chapters 1-13. In a thesis which is grounded in current scientific insights, it is difficult to escape the use of scientific 'jargon'. I want to apologize to those readers who might be interested in the subject of spirituality, but cannot stomach so much abstract language.

The ideas presented in this thesis are the product of many years of research, and reflect a personal journey through scientific literature in a variety of disciplines. The starting- and end-point of this study, however, are the resource-poor farmers in East Africa. I would like to express my appreciation for all the farmers who participated in the various programs in Mozambique, Kenya, Tanzania and Zambia. Without their willingness to share information and to explain 'obvious' issues to 'outsiders', and without their hospitality, this thesis would not have been written. I am also grateful to the many local and expatriate extensionists and researchers with whom I collaborated in the past twenty years.

I am greatly indebted to Prof. Dr. Ir. Eric Goewie for his willingness and courage to act as supervisor for an 'unconventional' thesis. His conviction that it must be possible to make the issue of 'spirituality' communicable in a scientific study, encouraged me to continue with this exercise. I am also particularly grateful to Prof. Dr. Ir. Niels Röling for his open-minded attitude with regard to issues that are 'new' to mainstream research. I thank both my supervisors for their insightful and critical review of my writings.

There is nothing new under the sun, in this thesis I have just been 'dis-covering' old truths. The only 'new' aspect of this study might be the specific combination of various theories. I have made grateful use of the theories of numerous authors. I want to single out O.D. Duintjer, A. Koestler, H. Koningsveld, C. Leeuwis, P. Ransijn, E.F. Schumacher, K. Wilber, and Maharishi Mahesh Yogi. Thanks are extended to Anne van den Ban, Otto Duintjer, Niek van Duivenbooden, David Gibbon, Paul Richards, and Tonnie Tekelenburg who commented on earlier drafts of this thesis. I gratefully acknowledge the useful and detailed comments made on this thesis by Cor van Eijnatten. Special words of thanks go to Hans van Asseldonk for being the first professor at Wageningen Agricultural University who encouraged me to study the issue of spirituality in the context of agricultural science, and to Lex van Loon for numerous stimulating discussions on the topic of this study.

Leo Haegens has been helpful in designing some of the diagrams, and Bob Hawkins corrected my 'Dutch-English' in chapter 13 (Summary and Conclusions).

Finally, I would like to thank my parents for their decision to let their children free in any choices they make. I am particularly grateful to Zaina Maimu, my partner-in-life and 'better half', who provided an enabling environment for writing a thesis. You are my best friend.

PART I

FSR theory and practice, and main issues selected

1 INTRODUCTION

1.1 Context and justification of the study

As a field agronomist, I have had the opportunity to participate in Farming Systems Research (FSR) activities in four East African countries since 1979 (in chronological order: Mozambique, Kenya, Tanzania and Zambia). The period 1975-95 witnessed the birth and gradual decline of FSR. FSR in East Africa is an approach to agricultural research which focuses on the large group of resource-poor farmers toiling at the countryside. Table 1 indicates that about 80 percent of the labor force in the four above mentioned countries works in agriculture. The average annual growth rate in food production per capita in Eastern and Southern Africa was from the early sixties to the late seventies -0.5 percent (Paulino 1987). Table 1 indicates that this growth rate in the period 1979-93 was negative in the four countries. This persistent negative growth rate for more than three decades is alarming.

The other economic indicators in Table 1 paint a similar bleak picture of the four countries in Sub-Saharan Africa (SSA) where I worked. The following single statistic is indicative of the poverty of SSA: the total GNP of the 45 countries in SSA (excluding South Africa) in 1994 was 78 percent of the GNP of The Netherlands[1]. Compared to other Low Income Countries (LICs), Sub-Sahara African countries receive considerable amounts of development assistance. For example, the Official Development Assistance (ODA) in Tanzania was in 1994 about 30 percent of the GNP, while the ODA in India and Bangladesh was respectively 0.8 and 6.9 percentage of the GNP (World Bank 1996). Table 1 shows that in the period after the introduction of Structural Adjustment Policy (SAP) reforms, the external debt has grown to “nearly unmanageable levels” (Finan 1993). Dependency on food aid also has increased (ibid.).

Donor-supported FSR projects were a popular component of development assistance to East African countries in the period from the mid seventies to the end of the eighties. The impact of agricultural research on the productivity level of the large group of resource-poor farmers has been limited. Unfortunately, FSR has not been able to reverse the tide. Although FSR contributed significantly to the understanding of farming practices and methodology development for diagnosis, experimentation and analysis (Tripp et al. 1990), the tangible results with respect to successful delivery of useful technology to resource-poor farmers have been only modest - as with other research strategies. There are relatively few documented cases where FSR has led to substantial adoption of technologies by farmers (Tripp 1991b,c; Low et al. 1991; Budelman & Van der Pol 1992; Berdegué 1993; Mutsaers 1994). It is a fact that FSR had only a modest impact on farmer welfare, but at the same time one should realize that agricultural research is only one component in the mix of conditions that must be in place in order to increase agricultural productivity. FSR has a role to play in the multi-dimensional process of rural development, but FSR is in the first place an approach to adaptive research, and not a comprehensive development philosophy or strategy. FSR cannot be held accountable for the multiplicity of factors that have constrained progress over the past two decades (Baker 1993).

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1. This calculation is based on data from Table 1. The GNP per capita in dollars 1994 was used, not the PPP estimates of GNP per capita in international dollars.

Table 1: Economic indicators for Mozambique, Tanzania, Kenya, Zambia, Sub-Saharan Africa, The Netherlands, and The United States.

Economic indicators	Mozamb.	Tanzania	Kenya	Zambia	SSA	Netherl.	USA
World-wide country ranking according to GNP per capita: 1994	2	4	17	28		121	128
Population in millions: mid-1994	15.5	28.8	26.0	9.2	571.9	15.4	260.6
Area in thousands of sq. km.	802	945	580	753	24,274	37	9,364
GNP per capita: Dollars 1994	90	140	250	350	460 w	22,010	25,880
Average annual growth (%): 1985-94	3.8	0.8	0.0	-1.4	-1.2	1.9	1.3
PPP estimates of GNP per capita:							
USA = 100: 1994	3.3	2.4	5.1	3.3		72.4	100.0
Current internat. $: 1994 **	860	620	1,310	860		18,750	25,880
Life expectancy at birth in years: ’94	46	51	59	47	52	78	77
Adult illiteracy in %: 1995	60	32	22	22	43	< 5 %	< 5 %
Female	77	43	30	29	54		
Male	42	21	14	14	35		
Prevalence of malnutrition (in % of children under 5): 1989-95	n.a.	28	22	27		n.a.	n.a.
Food production per cap. (avg. ann. growth rate, %):1979-93 *	-2.1	-1.3	-0.4	-0.3		0.4	-0.3
Percentage of labor force in agriculture: 1990	83	84	80	75	68	5	3
Official Development Assistance (ODA) as % of GNP: 1994	100.1	30.3	10.2	22.3	12.4		
ODA per capita in $: 1993 *	77.0	33.9	35.3	97.3	35.7		
Structural Adjustment Policy (SAP) implementation year ***	1986	1981	1983	1984			
External debt as % of GNP:							
Pre-SAP ***	n.a.	28	43	84	n.a.		
1994	450	229	112	204	79		

Source: World Bank (1996). World Development Report 1996: Tables 1, 3, 4, 6, 7, and 17: except * = from World Bank (1995). World Development Report 1995: Tables 4, 19.

Keys: n.a. = not available; blank = not applicable; w = weighted average (all averages for SSA are weighted averages); PPP = purchasing power parity.

** Estimates of GNP per capita in international dollars by applying the PPP conversion factor to local currency GNP and then dividing by the midyear population. The international dollar, used as the common currency, is the unit of account that equalizes price levels in all participating countries. The PPP conversion factor is defined as the number of units of a country’s currency required to buy the same amounts of goods and services in the domestic market as one dollar would buy in the United States.

*** Source: Finan 1993. Pre-SAP is calculated as the average of the three years prior to the implementation of the SAP reform.

Although this study focuses on FSR in East Africa -my field of expertise and experience in the last 20 years- the coverage and implications of the study are much wider. This is due to: (1) the claim that FSR is a holistic approach; (2) my predisposition that a sound understanding of the limited impact of FSR requires a thorough analysis of its underlying philosophical basis, i.e., the scientific paradigms which are at the basis of FSR theory and methodoloy; and (3) the promotion of FSR in the European context which recently has been advocated (Dent & McGregor 1994). These factors make this analysis relevant, not only to the East African situation, but also to the European agricultural situation. I use the analysis of FSR in East Africa as a convenient stepping stone to a study of some issues at the heart of the agricultural research system.

The importance of learning from past experiences is emphasized by several authors (Tripp 1991a; Schiere 1995:30).

> "It is disturbing that the energy and imagination generated by FSR and other such movements are often dissipated by the inevitable changes in fashion and interest which affect the development field. The tragedy is not that these movements fail to achieve everything they set out to accomplish, but that too few of the lessons they produce are articulated or used" (Tripp 1991a).

An important objective of this study is to make full use of the many lessons produced by FSR in order to increase the likelihood that more recent trends in the field of development cooperation will have more impact on resource-poor farmers' welfare. The more recent trends are sustainability and natural resource management, NGOs, gender, participatory technology development, the private sector as an important force for development, and global trade liberalization.

1.2 Research question

A gap exists between FSR theory and its actual practice (Baker 1993; Berdegué 1993; Mutsaers 1994; Meindertsma 1994:9). FSR practitioners, with the help of other actors in the rural development process, aim at bridging this gap. With Berdegué (1993) I am wondering why the success of FSR has been limited while FSR is "such a logical and coherent proposition". My main motive to write this book originates from feelings of amazement and frustration. A feeling of amazement because I am wondering why it is so difficult to implement holistic FSR, and a feeling of frustration because many years of agricultural research and extension (including two decades of FSR) in East Africa had so little impact on the well-being of millions of resource-poor farmers. These feelings of amazement and frustration resulted in the main question of this study.

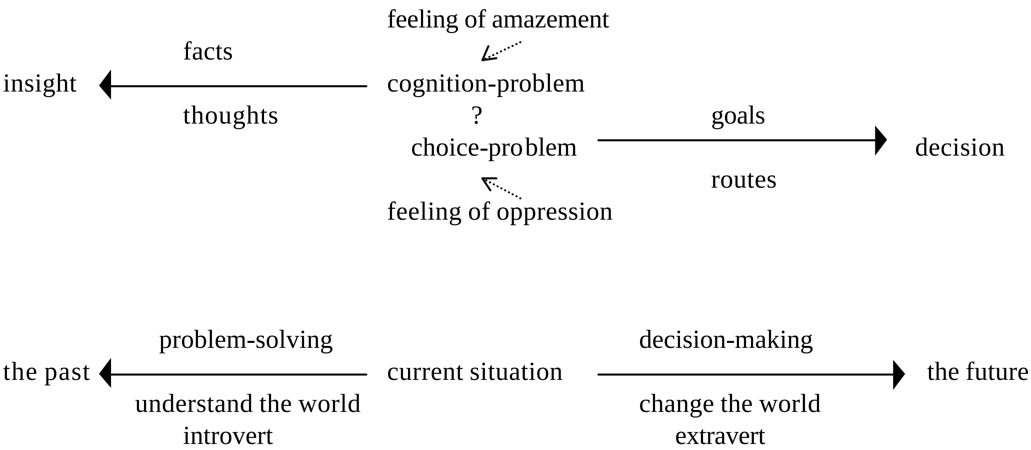
A model of problem-solving and decision-making in which these feelings of amazement and frustration play a role, is the model developed by Bos (1974). Bos (1974:213) maintains that his model is in strong contrast with most other models of problem-solving and decision-making, which are built on the logic of thought, whereas his model is based on empirical data. Problem-solving and decision-making processes do not proceed linearly along the path: (a) collect information; (b) generate and weigh alternative solutions; and (c) make a decision. Cognition- and choice-processes are searching processes, heuristic and iterative in nature (‘heurisko’ in Greek: to find) (ibid.:55). These processes are heuristic processes of rhythm enacted between poles (ibid.:62):

- as an inductive-deductive rhythm between facts and thoughts
- as an ethical-practical rhythm between goals and routes
- as an investigating-undertaking rhythm between insights and decisions
- as a speaking-acting rhythm between words and deeds.

In Diagram 1 a schematic representation of the model of Bos is given. This model is an ideal-typical model, characterized by polarity and rhythm[2].

> “The most striking polarity is that between cognition and choice. Cognition deals with insight; man wants to understand the world. Choice deals with decisions; man wants to change the world. Cognition begins with a feeling of amazement, choice with a feeling of oppression. Insight comes as a result of clarifying facts through thinking about them. Decisions are connected with the goals that one wants to reach by certain routes. Between facts and thoughts on the one side, and goals and routes on the other, there seems to be the same polar reaction as between cognition and choice. Assessment can be described as a process of rhythm which is enacted between these poles” (Bos 1974:213).

Insights ‘grow’, decisions ‘ripen’, and judgements ‘develop’ (ibid.:55). In the model an ideal-typical distinction between the cognition- and choice-processes is made. In practice, however, these two processes cannot be separated. The cognition- and choice-processes can only be distinguished in their tendencies towards ‘understanding the world’ and ‘changing the world’ respectively; the first one is more ‘introvert’ while the latter is more ‘extravert’. There is an ‘inside-outside’ polarity (Bos 1974:29,32). While the cognition-process starts with a feeling of amazement, a feeling of being excluded, resulting in the question ‘how do I get into that’, the choice-process starts with a feeling of oppression or frustration, resulting in the question ‘how do I get out of this’ (ibid.:28)[3].



2. Bos (1974:55) refers to Goethe for these heuristic processes of rhythm enacted between poles. Goethe maintains that life processes (of plants, animals, human beings and social organizations) are characterized by two basic phenomena: rhythm and polarity.

3. In an ideal-typical way the question ‘how do I get into that’ refers to unification with the phenomenon under investigation through authentic insight. In more religious terms this unification could be referred to as ‘to see the Divine’ (= ‘theorema’ in Greek) (Bos 1974:28).

Diagram 1: A model of problem-solving and decision-making (adapted from Bos 1974:29).
Cognition begins with a feeling of amazement, and insights come as a result of clarifying facts through thinking about them. Choice begins with a feeling of oppression, and decisions are connected with goals, that one wants to reach, by certain routes.

As an example of a heuristic process of rhythm enacted between poles, the first polarity between facts and thoughts will be discussed. A group that endlessly collects facts, in the hope that a clarifying thought will more or less automatically emerge, does not get far. Nor does a group that constructs all possible explanations and suppositions without testing them against the facts. A discussion becomes fruitful, when after an initial exploration of the facts a preliminary explanation is constructed. Then, testing against more and other facts takes place, which in turn may result in better understanding. In this way, insight develops in an inductive-deductive rhythm between facts and thoughts (Bos 1974:58). Another example is the third polarity between insights and decisions: only planning of goals and routes is not sufficient. Insight in the causes of the current problematic situation is needed, as well as a notion of the present and future situation in which certain goals must be realized (ibid.:60)[4].

The cognition-process is the ground for realistic and competent decision-making in the choice-process. Authentic insight emerging in the cognition-process is the foundation for high-quality decision-making in the choice-process (Bos 1974:31). It is important, however, to emphasize that Bos' model is a model of balance, which aims at raising awareness of the balance between the cognition- and choice-process (ibid.:110). Insight in -and receptivity for- the principle of polarity and rhythm is important (ibid.:60). Rhythm -a movement between two poles- is a very delicate, never exactly predictable, continuously adapting play between poles. Development requires both poles. Rhythm brings the poles in a state of dynamic balance. The one pole does not deny or destroy the other one, but both poles are in dialogue (ibid.:57). The characteristic of rhythm is not the permanently 'being in balance', but the play between poles (ibid.:113).

Now returning to the formulation of the main question of this study, I recall that the starting-point of the cognition-process is a feeling of amazement, exemplified in my question '*why* is it so difficult to implement holistic FSR'. At the same time, the gap between a holistic FSR theory and its actual practice results in a feeling of frustration - the starting-point of the choice-process. This feeling of frustration results in a 'how' question: *how* can we establish a holistic FSR practice, *how* can we bridge the gap between FSR theory and practice. Looking at the vast body of FSR literature, I get the impression that most FSR practitioners are more interested in the 'how' question than in the 'why' question. Apparently, it is easier for FSR practitioners to start *doing* something, in the sense of incorporating new methodologies and aspects in the FSR approach, than to sit back and ask themselves why the gap is there in the first place. The FSR approach becomes more and more encompassing, including such issues as gender, participatory technology development, indigenous knowledge, and sustainability. The FSR train has to pull more and more wagons, and under the continuous pressure of funding-deadlines and project cycles the train rolls on without breaks (brakes) for reflection. While I fully understand and value, being a field agronomist myself, that problem-oriented FSR practitioners are more interested in the 'how' question, I do believe that

4. In East Africa 'planning' is an important activity of government agencies. In my view this is often basically a waste of time and effort, since analyses of 'why' previous attempts failed, are not made. Government and donor agencies frequently lack realistic notions of actual field situations. An obvious example are the low salaries of government staff, which make that most attempts to create momentum in the development process falter because of low motivation.

some time should be reserved for reflection on the 'why' question. A fundamental difference exists between the questions[5]:

"*Why* is it so difficult to improve the ability of FSR teams to develop sustainable farming systems"

"*How* can one improve the ability of FSR teams to develop sustainable farming systems"

The first question -the *why* question- implies a thorough diagnosis of the problem: more insight in the actual implementation of FSR is required before answers can be offered. When we understand what *actually* happens in FSR, we can also understand why what *should* happen does not materialize. Before we can close the gap between FSR theory and actual practice, we first have to answer the *why* question. This question also raises the possibility that our ability to influence the performance of FSR teams might be more limited than we generally assume - at least with the approaches that hitherto have been employed[6]. A thorough, comprehensive analysis will, more or less automatically, provide clues on *how* to improve the ability of FSR teams to develop sustainable farming systems. The answer on the *why* question -the main question in this study- will (hopefully) result in improved methodologies.

The second question -the *how* question- is instrumentalistic in nature and presupposes that with additional techniques and methodologies the ability to develop sustainable farming systems can be enhanced (*additional* in the sense of added to the basic FSR methodology which will be discussed in chapter 2). This approach -the conventional answer to bridge the gap between theory and practice- certainly has produced improved methodologies, but it also frequently resulted in symptom fighting. The right-hand side of the model of Bos (Diagram 1) refers to my *how* question, and the left-hand side to the *why* question.

Before we continue with the next section, I first want to say something about the term 'sustainable' in above questions. The ultimate goal of FSR is to develop sustainable farming systems for the target group of resource-poor farmers. The concept 'sustainability' as used in this study does not only refer to ecological sustainability, but has a much broader meaning: farming systems should be sustainable from an ecological, technical, economic, political and socio-cultural point of view. The multi-facets of sustainable agricultural and rural development must include ecological responsibility, technical feasibility, economic viability, ethical defensibility, social desirability, and aesthetic acceptability (Bawden 1995). Conventionally, only the second and third aspect are included in FSR studies. All this implies that the development of sustainable farming systems should take place in a holistic mode. The concepts sustainability and holism are closely related in this study, whereby the concept holism does not only refer to an approach which pays attention to all possible aspects of farming systems, but also refers to the recognition that the whole is more than the sum of its parts. In this context the distinction between 'research' and 'design' is relevant. Research aims at explanation of the reality, it aims at new knowledge or insights, and is analysis- and conclusion-oriented. Designing, on the other hand, starts from goals or wholes that one attempts to realize in the design process. It is synthesis- and decision-oriented, and aims -in our case- at new sustainable farming

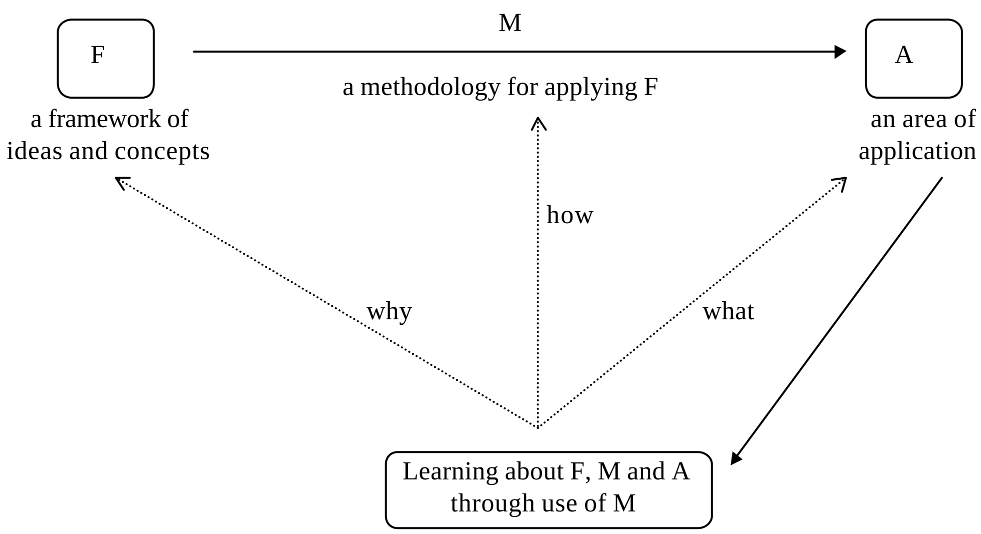
5. These questions are inspired by Wagemans (1987) and Bos (1974).

6. For example: the training courses on FSR methodology organized by CIMMYT during the last 15 years in East Africa had an only modest impact on the performance of FSR teams. The impact on the effectiveness of the East African agricultural research systems as a whole (on-farm and on-station research) was marginal.

systems (Goewie 1993). In the design process one needs a notion of the future situation, in which certain (sustainable) goals must be realized. In the model of Bos (Diagram 1) the right-hand side of the model represents the design process, and the left-hand side the research process. While the research process is reductionistic in character, the design process is holistic in character. In order to develop sustainable farming systems both ‘poles’ are required: insight in -and receptivity for- the rhythmic play between poles is needed.

1.3 Research framework and methodology

The general research framework, based on iterative experiential learning, is presented in Diagram 2. In this diagram the learning about F -underlying frameworks and paradigms- refers to the *why* question. The learning about M -the FSR methodology and other methodologies- refers to the *how* question. And the learning about A -the area of application: in this case the actors in the field of rural development in East Africa- refers to the *what* question (what are the effects of M on A). In the area of application my main interest was with the attitudes, worldviews, knowledge and practices of the various stakeholders in the process of rural development, with an emphasis on agricultural researchers.



F = theory of FSR + other relevant concepts, and underlying paradigms
M = the FSR methodology + other methodologies
A = the actors in the field of rural development in East Africa

Diagram 2: The general research framework: iterative experiential learning
(adapted from Checkland 1985 & Hamilton 1995).

The answering of the *why* question requires a qualitative and reflexive approach which allows me to probe main issues over time (1979-1998) and space (four East African countries). My experiences in East Africa provide the empirical, qualitative basis for this study. The study is an account of reflected practice, an account of my own experiential learning process. My own experiences as an agricultural researcher are starting-point and permanent reference in this study. They constitute the basis and background of the study. The reflexive practice mainly took place in The Netherlands in the periods in-between long-term assignments in Africa. The review of work experiences and relevant literature in those periods resulted in extensive notes, which are used in the compilation of this book. The methodology applied in Africa was participatory observation: I was simultaneously participant researcher in the project teams (expatriate team member) and participant observer.

Bos' model of problem-solving and decision-making (Diagram 1) is in fact a model of an iterative experiential learning process. It emphasizes the importance of finding the right rhythm between gaining experience of reality through changing it, and gaining insight in this reality through retrospection (Bos 1974:61). This is exactly what I have done in the last 20 years: I worked in Africa, and reflected on these working-experiences in The Netherlands. A problem with Bos' model is that the entire process of cognition and choice takes place in the verbal sphere. The right-hand side of the model -the choice process- is restricted to *talking* about decisions. Only in the last polarity mentioned at the beginning of section 1.2 -the polarity between words and deeds, which is not a part of this model- actual engagement in *action* can be realized (ibid.:62). The thinking-doing rhythm between insights and actions is crucial.

The advantage of my work experience in various settings is that a thorough knowledge of the actual practice of FSR in East Africa was obtained. More than twelve years of working and living at the East-African countryside, in close contact with local farmers, researchers and extensionists has been crucial in the development of my perspective. The importance of information obtained as an insider and in, especially, informal settings is difficult to overestimate (Wagemans 1987). It is important to get a picture of the whole reality. A holistic perception implies that conflict- and competition situations, hidden agendas, and behavior in formal *and* informal settings must receive attention. This is not easy since the researcher is in fact interpreting the actors' interpretation of reality. Different actors might have different perceptions of reality. The ability to put oneself in someone else's shoes (empathy) is important for researchers in order to understand the possibly conflicting perspectives of multiple actors (Wagemans 1987; Huizer 1995; Millar 1996). Empathy does not necessarily imply subjectivity, as long as worldviews and predispositions are explicated (see section 1.4). An additional reflection on the scientific justification of the process of development of this study is presented in an epilogue.

1.4 Explicitation of worldview and predispositions

In order to answer the main research question (the *why* question) an in-depth analysis is required. This comprehensive analysis, which touches on various fields of science -agricultural science, philosophy of science, environmental-philosophy, perennial philosophy (metaphysics), sociology, psychology, and (soft) systems thinking- inevitably involves worldviews. All observation, interpretation of data, and practical action are, inescapably, theory laden (Kuhn 1970; Popper 1972; Feyerabend 1975).

> "..all human thinking rests on basic assumptions or intuitions and .. it is impossible to think without such commitments or to doubt all of them at once. ..there are no uninterpreted facts. One's initial assumptions and view of the nature of reality determine to a large extent what one sees and hears and experiences with the other senses" (Baer 1989).

I am conscious of the fact that my worldview can introduce biases to the interpretation of my work experiences and the ensuing selection of the main problematic issues in the implementation of FSR. This awareness in itself can reduce the impact of worldview bias, but complete elimination is not possible (Hamilton 1995:73). Participatory interpretation by others (supervisors and readers with first-hand experience in the issues under study) will further reduce this source of bias. Another triangulation technique used is the comparison of experiences in four different countries. When similar issues crop up in each country the likelihood that we deal with core issues increases considerably. The lessons learned in this study are a product from cross-fertilization between work experiences in four countries.

The feelings of amazement and frustration (section 1.2), and the subsequent analysis of my professional experiences, led me to scrutinize my worldview. In doing so, I found the concept 'spirituality' on my learning path. I feel that spirituality can lead agricultural science onto a new road with potentially practical relevance. Since scientists should be 'road constructors rather than passive travellers' (Von Krogh & Roos 1996:156), I feel it is worthwhile to pursue the option of investigating underlying worldviews. Worldviews, however, cannot be choosen on scientific grounds. At this point in my study, I just want to state that my predisposition is that at this moment in time three different scientific paradigms exist. These three paradigms -the positivist, constructivist and transcendentalist paradigms- do coexist, and each paradigm has its relative strengths and weaknesses. The at present most dominant scientific paradigm -the positivist paradigm- is an approximation of reality which is useful in certain conditions. Similarly, the constructivist and transcendentalist paradigms can contribute to the solving of some problematic issues in the field of agricultural research. Each paradigm has its own niche, but in my view a simultaneous use of the various theoretical concepts and practical methodologies of the different paradigms stands most chance to be successful. In order to answer the *why* question, and to be able to develop holistic approaches to create sustainable farming systems, each paradigm has a role to play. In order to facilitate an initial explicitation of my worldview, I refer to Table 2 which presents a very simplified characterization of the three different scientific paradigms.

Table 2: Simplified characterization of three scientific paradigms by three different criteria

	Positivist paradigm	Constructivist paradigm	Transcendentalist paradigm
Methodology	experimental testing	dialectical debate, interaction, communication, actor-oriented approaches	methods for consciousness development (e.g., meditation)
Systems thinking	hard systems thinking	hard, soft and critical systems thinking	beyond hard, soft and critical systems *thinking*
Keyword	matter	mind	spirit

The similarities and differences between the three paradigms will be discussed in later chapters (chapters 6, 9 and 10).

Here I want to give an example of the complementarity of the three paradigms. An important mission of Wageningen Agricultural University is to develop sustainable farming systems. A fruitful contemporary approach to achieve this laudable task is systems thinking. To my mind, it is important that the current gap between hard and soft systems thinking, and between natural and social sciences, is bridged. The single application of computer simulation models, such as Interactive Multiple Goal Planning Models, cannot solve the problematic interface between hard and soft sciences.

> “The models are based on an integration of the ‘hard’ sciences and economics, to the extent that economics can fit human action into predictive formulae. However, the soft sciences cannot and do not want to be fitted into such models. They form an unrelated ‘camp’. The major problem is that hard and soft sciences work from totally different epistemologies, with the former embracing positivist and even realist assumptions about the nature of human knowledge, while the latter take a constructivist position” (Röling 1994a:286).

In my view, the transcendentalist paradigm can be helpful in the attunement of the positivist and constructivist positions. From the perspective of the transcendentalist paradigm both previous paradigms can contribute to the development of sustainable farming systems. As will be argued in more detail later on, the attunement of hard and soft sciences requires in the first place a change in consciousness. The attunement of *hard* and *soft* systems *thinking* is not hindered so much by the difference between *hard* and *soft* as by the common element, i.e., the emphasis on *thinking* as the only valid way to obtain knowledge. The continual identification with the rational-empirical consciousness (Duintjer 1988b) -the single reliance on the discursive intellect- with both hard and soft scientists could be the main problem. In the transcendentalist paradigm the mode *thinking*-being is not the only possible mode of being: in this paradigm another mode of being characterized as just *being* or *consciousness-as-such* is emphasized (chapters 8 and 9). In order to create sustainable farming systems I recommend a sustained use of the critical intellect in hard systems thinking and in soft systems thinking, in combination with an *experiential* spirituality. My hypothesis is that an experiential spirituality -a spirituality based on personal experience and practical self-investigation- can help to guide development in an environmentally friendly, ‘life-supporting’ direction. In ecological agriculture the phenomenon ‘life’ is not reduced to physical and chemical variables as is the case in conventional agriculture, but ‘life’ is considered to be an entity in itself with an autonomous, intrinsic value (Goewie 1993). Spirituality might assist in the development of an ecological agriculture, which is based on this less reductionistic concept of ‘life’.

The presentation of the transcendentalist paradigm is a first attempt, an exploratory endeavor to introduce a hitherto largely missing element in the discussion on the development of sustainable farming systems, i.e., the factor spirituality. Although the introduction of this factor in the field of agricultural research is experimental and new, at first sight the preliminary theoretical proposition of the transcendentalist paradigm -with its practical component of experiential spirituality- seems intuitively valid and potentially useful. It is questionable whether this new paradigm easily can challenge the overwhelming dominance of the positivist scientific paradigm, but on the other hand more and more signals emerge which indicate that a dimension seems to be overlooked. My main interest at this point is to keep open the possibility to combine science and spirituality. This combination might be helpful in the coming to grips with the current persistent problems in the development of sustainable farming systems. It is always relatively easy to explain retrospectively what went wrong in the past, but much more difficult and challenging to understand prospectively how a brighter future can be realized. But I consider it legitimate to critically reflect on the foundations of contemporary agricultural science in order to enlarge our understanding and to provide insights that can enrich the future. I hope that on the basis of both empirical observations (my work experiences) and my theoretical framework (the transcendentalist paradigm) I can show that experiential spirituality is not coming out of the blue. It is (still rather speculatively) assumed that the transcendentalist paradigm will enhance the breadth of knowledge and depth of insight in our problem-ridden world. I will try to make plausible that spirituality has the potential to assist us in the difficult task of realizing the mission of Wageningen Agricultural University: the creation of a sustainable future, in the North and in the South. Although a practical elaboration of the transcendentalist paradigm in the field of agriculture is still largely missing, the argumentation and evidence presented in this book is, to my mind, sufficiently convincing to warrant more attention from agricultural scientists. Moreover, I will develop testable hypotheses in this exploratory study.

In principle the construction of theoretical frameworks (or grounded theory) should follow, not precede, the researcher's familiarization with reality or day-to-day practice. These steps, however, cannot be fully separated. Any perception of reality implies the (unconscious) use of theoretical frameworks, concepts, and earlier experiences. Observation is always observation from the perspective of the observer: the researcher cannot detach himself completely from his analytical perspective. The researcher can only *attempt* to do this: perception and formulation of theory should be influenced as little as possible by his perspective - as a researcher *and* as an individual person (Wagemans 1987).

Since this is an exploratory study it is important to make explicit my predispositions, assumptions, points of departure or -if you wish- biases. These assumptions stem from my work experiences -"from reflective practice rather than from scientific inquiry" (Engel 1995:24)- and they are intuitively considered to be relevant to the topic of this study. My main assumption, as indicated above, is that spirituality has a role to play in the development of sustainable farming systems. Four more points of departure are:

1) The limited human intellect cannot cope with all the aspects of a holistic research approach for the development of sustainabe farming systems. In the mid-seventies I decided to select four subjects for my M.Sc. study at Wageningen Agricultural University: tropical crops science, tropical animal production, development economics, and non-western agricultural cooperatives and finance[7]. Although this choice of subjects proved to be a suitable starting point for my career as FSR agronomist, it always remained difficult to integrate the diverging subjects in my professional jobs. Engel (1995:24) says in his thesis on innovation in agriculture: "... no single actor can develop a fully comprehensive view of all processes relevant to innovation".

2) The goals/objectives of the multitude of actors in the rural development process differ. Each actor has his/her own formal and *informal* objectives: hidden agendas can play an important role. One must make a distinction between what people say they do (the norm) and what they actually do

7. At that time there was some resistance of the Department of Tropical Crops Science to select four 'such widely divergent' subjects. I am still grateful to Professor Ferwerda that -after a protracted discussion- he agreed on my combination of two hard and two soft subjects. Although at the time he was doubtful whether I ever would find a job with such a combination of subjects (I was the first student of the Department of Tropical Crops Science who took the subject non-western agricultural co-operatives and finance), he finally approved my combination of subjects. In 1972 Professor Ferwerda was also the person who convinced me to become a tropical-oriented agronomist by his remark in a lecture for in-coming students that 'liefde voor het vak' (love of one's profession) is the most important criterion to go by in the selection of a specialization.

(the practice) (Colin 1994)[8]. Differences in perceptions and/or interests may not always be mendable (Engel 1995:24).

3) The ability or power of the top management of research and extension organizations to influence events is smaller than generally assumed. Wagemans (1987) investigated why the application of rational planning and decision making models to the practice of public service bureaucracies so often proves problematic. His conclusion is that the *formal* power to take decisions about what *should* happen is large at the top of organizations, and small at the basis of organizations. The *actual* power to take decisions about what *actually* happens, however, is small at the top of organizations, and large at the basis of organizations (ibid.:105). In other words, at the end of the day it are the staff members at the basis of organizations who determine what really happens. The study of Wagemans dealt with a public sector bureaucracy in The Netherlands. In my opinion his conclusion certainly also applies to the East African situation[9]. The *rational* planning and decision making models employed by bureaucrats apparently do not cover the wide spectrum of human behavior: rationality constitutes only one aspect of human behavior. It is my belief that societal changes are rooted in the (collective) behavior of individuals[10]. This pivotal position of the individual plays, in my view, also an important role in the rural development and FSR process.

4) The last assumption, which partially overlaps with the previous one, is that innovation-related processes are largely self-guiding. Full control is not possible (Gubbels 1994). We can only aim at facilitating or enabling such processes.

> "Unintended consequences of intentional as well as unintentional actions may be expected to affect innovation both positively and negatively. ... Intervention methodologies may seek to decrease such uncertainties yet have to accommodate to coping with a considerable degree of randomness which will still persist" (Engel 1995: 25).

1.5 Outline of the book

This study is divided in three parts. Part I (FSR theory and practice, and main issues selected) includes this introductory chapter, discusses the FSR theory and methodology as far as relevant to East Africa (chapter 2), provides an analytical perspective for interpretation of work experiences and literature, and for selection of main issues (chapter 3), gives an overview of my

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8. "The existence of contradictions between different types of action/practice (e.g. between what people 'say' and what people 'do'), or even blatant 'lies' that respondents express, are not to be seen as mere methodological problems, but rather as having an informative capacity of their own that increases our understanding of the complexities and contradictions of social life" (Leeuwis 1993:126).

9. Hyden's (1980, 1983) observations about an uncaptured peasantry and an 'economy of affection' in Tanzania refer to the dichotomy between the formal governmental power and the informal, actual power of the peasants. See also Latour (in Leeuwis 1993:107) in my section 9.3. Millar (1996:22) says that for the people of northern Ghana the government is an anonymous entity "on which they lay claims, and irrespective of which they would still continue their life style".

10. In 1970, at the beginning of my academic career, I was 'lightning-struck' by Erich Fromm's book 'Escape from freedom' (1941). In this book Fromm describes the psychology of Nazism as an escape from freedom, and a flight into authoritarianism, destructivism and conformism. Fromm emphasizes that societal changes are rooted in the (collective) behavior of individuals; individuals who tend to unload their responsibilities onto someone -or something- else.

work experiences (chapter 4), and clusters the operational problems -encountered in work experiences and FSR literature- around four main issues: holism, interdisciplinarity, attitudinal factors, and lack of countervailing power (chapter 5). In Part I the initial learning about F, M and A (see Diagram 2) takes place.

Part II (Underlying paradigms) starts with a characterization of the two paradigms which underlie contemporary agricultural science: the positivist and constructivist paradigms (chapter 6). Subsequently the chapters 7 and 8 depict the contours of a 'new' emerging paradigm characterized by holism and (ecological) spirituality. In chapter 9 a holistic framework for the multidimensional rural development process is formulated, and the transcendentalist paradigm is introduced. In the last chapter of Part II we re-visit the constructivist paradigm in order to assess it from the perspective of the transcendentalist paradigm (chapter 10). In Part II we learn about F, M and A, and about the main issues holism and lack of countervailing power.

In Part III (Back to FSR) the two remaining core issues -interdisciplinarity and attitudinal factors- are discussed (chapter 11). At this point the *why* question has been adequately answered, and suggestions on how to close the gap between FSR theory and actual practice have been provided. Subsequently a chapter on the use of intuitive heuristics in agricultural science and farming is included (chapter 12). A summarizing chapter with the main conclusions (chapter 13) and an epilogue with an additional reflection on the scientific justification of this study (chapter 14) conclude the book. In Part III we learn more about F, M and A, and the understanding of the main issues interdisciplinarity and attitudinal factors is enhanced.

As indicated earlier I have to make use of various fields of science in this comprehensive analysis. In order to keep the main text easily readable and coherent, some citations of experts in the various disciplines consulted are placed in the main text; remaining citations and remarks are placed in footnotes. The applied nature of FSR and the problem-oriented focus of FSR practitioners make that farmer problems have priority over reflection on conceptual issues. The disciplinary training of FSR scientists makes it difficult to attain conceptual consensus. Instead of investigating the underlying paradigms most FSR practitioners find it easier "to move on to the next practical problem" (Moore 1995). With regard to the (interlinked) philosophical and holistic emphasis in this book, I would like to quote Bawden (1995) who says:

> "To those who would be dismayed by the theoretical/philosophical focus of this article, I conclude with two observations: firstly that there is nothing so practical as a good theory, and secondly, that any approach which claims to embrace 'systems' in its title, needs to be able to defend that position".

2 THEORY AND METHODOLOGY OF FSR

2.1 Characteristics of FSR

In this chapter the theory and methodology of FSR will be presented (F and M in Diagram 2). A farming system may be defined as:

> “a complicated, interwoven mesh of soils, plants, animals, implements, workers, other inputs and environmental influences with the strands held and manipulated by a person called the farmer who, given his preferences and aspirations, attempts to produce output from the inputs and technology available to him. It is the farmer’s unique understanding of his immediate environment, both natural and socioeconomic, that results in his farming system” (Dillon et al.:1978).

This definition emphasizes that a farming system is a *complicated, interwoven* system in which the decisions of *a human being* (male or female) feature prominently. In this study the complexity of smallholders’ farming systems, consisting of several interdependent components which constitute a coherent whole, and the centrality of the farmer -the human factor- are stressed. Unfortunately, the above definition from 1978 speaks still of *the male farmer*. Since then gender has become an increasingly important issue in FSR (Poats et al. 1988). Intra-household differences between men and women in agricultural tasks and objectives cannot be ignored (see section 5.1: operational problem 5).

Farming Systems Research is an approach to agricultural research which takes the whole farm as a starting point for analysis. The main characteristics of FSR are: it is farmer-oriented, it is systems-oriented, it is problem solving, comprehensive and interdisciplinary, it is complementary to existing research, it tests technology in on-farm conditions, it provides feedback from farmers, it is iterative, dynamic and responsible to society (Shaner et al. 1982; Merrill-Sands 1985, 1986; Norman et al. 1994). The systems-orientation, and the comprehensiveness and interdisciplinarity of FSR (at least in theory important characteristics) contribute to its holistic character. The claim of FSR to be a holistic approach will feature as a prominent issue in this study. The main roles of FSR are the forging and/or strengthening of linkages between researchers of different disciplines, between on-station and on-farm researchers, and between researchers and their major clients, i.e., farmers, extensionists, policy-makers, and other stakeholders in the rural development process (Stoop 1987a). These roles also indicate the holistic character of FSR.

Many different names have been given to FSR activities (Merrill Sands 1986; Simmonds 1986). In this study I will adhere to the most commonly used term Farming Systems Research, although in my view the term ‘Research with a Farming Systems Perspective’ is more appropriate. Byerlee et al. (1982) were the first ones who used the term ‘Research with a Farming Systems Perspective’. They define the *farming systems perspective* as the explicit recognition of the importance of interactions in a farming system. A farming systems perspective implicates a holistic point of view: all factors or levels which are related to the farming system under study should be taken into account. The farming systems perspective must be complete or ‘whole’. It is important that the farming systems perspective permeates the *whole* agricultural research system, including discipline- and commodity-oriented *on-station* research. Plucknett et al. (1987) correctly argue that besides on-farm research also base-data analysis and research station studies are vital areas of FSR. In research with a farming systems perspective one cannot differentiate sharply between on-station and on-farm research. Stoop (1987a) favors the farming systems perspective terminology because it indicates that FSR is not a separate science, but “an approach and a scientist’s attitude towards agricultural research”. Although I whole-heartedly subscribe to this statement, I will adhere to the term FSR because I do not want to add to any further proliferation of terms[1].

FSR is not a separate science or discipline, but part of a larger ‘movement’ which signals a breakaway from narrow-minded, disciplinary thinking about agriculture. This movement includes many concepts and methodologies: the farmer-first paradigm; user groups; agroecosystems analysis, Rapid Rural Appraisal and Participatory Rural Appraisal techniques; equity, gender and social science contributions; informal research and experimentation; links with NGOs; and institutional innovations (Gibbon 1994a). These concepts and methodologies complement the basic FSR methodology as presented in the next section.

2.2 The FSR methodology as used in East Africa

Most National Agricultural Research Systems (NARS) in East Africa follow the FSR methodology as developed by the International Wheat and Maize Improvement Center (CIMMYT)[2]. This CIMMYT approach to FSR is presented in Diagram 3. In addition to the various stages of on-farm research, the important bi-directional links to on-station research and to the policy arena are also indicated (CIMMYT 1987). Although the emphasis in Diagram 3 is on the on-farm research component, it must be emphasized that on-farm research is complementary to on-station research. Both components are necessary in order to develop FSR that is relevant to the large majority of resource-poor farmers toiling in the East African countryside. In a similar vein, it can be argued that an adequate policy environment is indispensable to sustainable rural development. Notwithstanding the indication of the bi-directional links to the policy arena and to on-station research in Diagram 3, the feedback of FSR to the policy environment and to experiment station research has been limited - as will be discussed later (section 5.1: operational problems 1, 3 and 6).

2.3 Reasons for development of FSR

Broadly speaking, two reasons can be given for the emergence of the FSR approach: 1) earlier research approaches did not succeed in improving smallholders’ farming systems; and 2) the continuing specialization in agricultural research and education required a methodology which allows for integration of different disciplines.The first reason entails that the FSR approach developed as a response to the failure of conventional on-station research to increase agricultural productivity on farms of resource-poor farmers (Norman et al. 1994:3). The technologies which were developed by research and promoted for adoption by extension, had problems of accessibility,

1. In order to end the ambiguity in terminology and conceptualization, Merrill Sands (1986) and Simmonds (1986) have proposed classifications for research activities which till then all had been incorporated under the broad label of FSR in literature. In the classification of Merrill Sands most FSR undertaken in East Africa should be named Farming Systems Adaptive Research (FSAR). However, both classifications are not adhered to in literature. FSR remains the most commonly used term.

2. The CIMMYT approach to FSR as given in Diagram 3 -taken from a CIMMYT publication of 1987- is basically the same as the FSR approach for Eastern and Southern Africa described by Norman et al. in 1994.

technical feasibility, social acceptability, economic viability, and compatibility with farmers' value systems (Calub 1985; Taylor 1988). Really appropriate technologies were, and still are, often not available: system compatibility with the farming systems of resource-poor farmers is, apparently, difficult to achieve. Neither extension nor research staff can afford to let themselves be guided by the image of the farmer as a pure *homo technicus*.

> "Farmers' production problems are by no means only technical, but also sociocultural, economic, or managerial. As farming is a way of life and not a mere profession, the sociology and the (micro) political economy of this way of life explain the adoption or nonadoption of novel agrotechnologies" (Cernea et al. 1985:8).

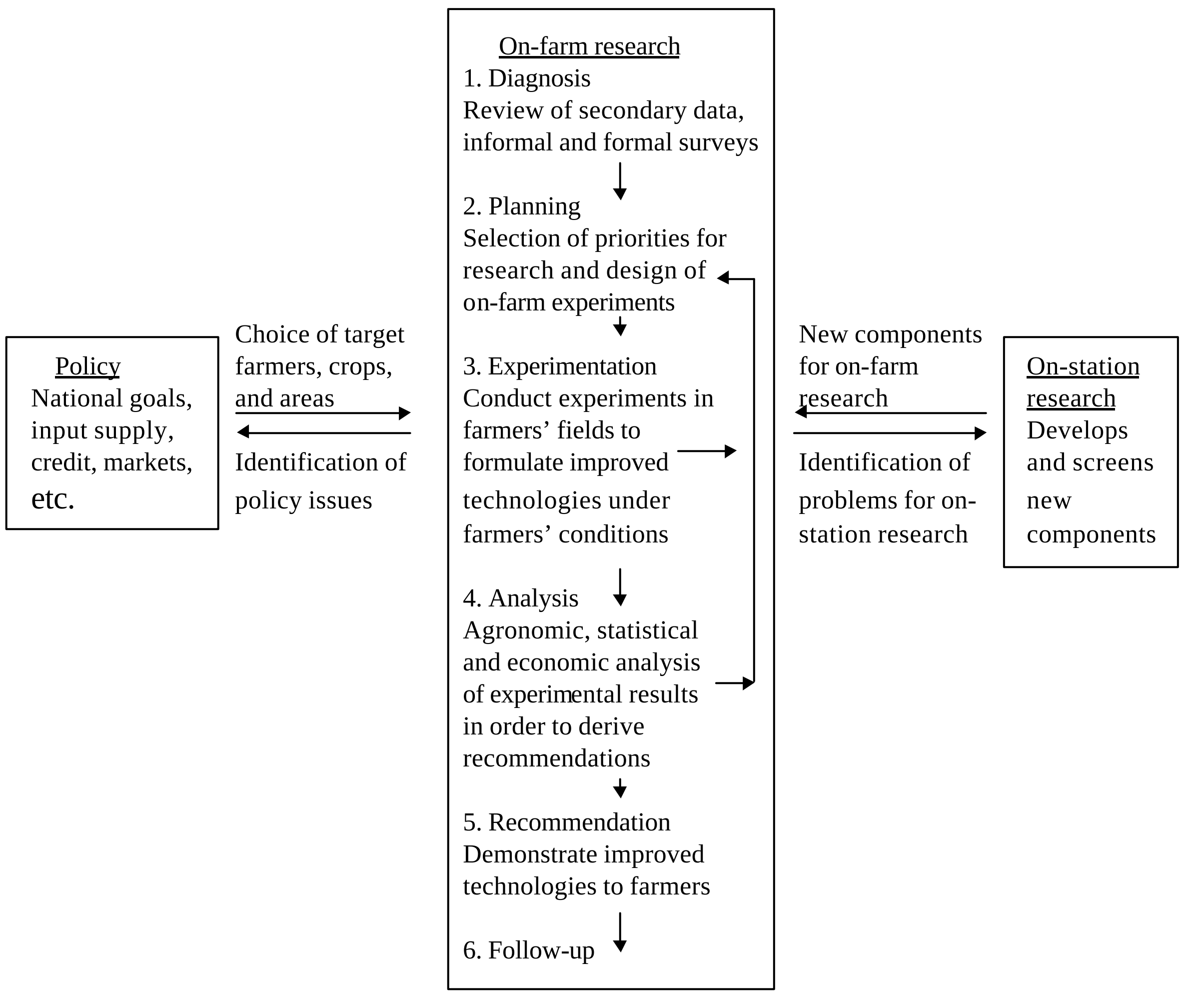

Diagram 3: The CIMMYT approach to FSR (Cimmyt 1987).

Most conventional on-station research only paid attention to technical aspects of farmers' production problems. Smallholder farming as 'a way of life' requires, however, a farming *systems* perspective which takes into account all aspects of the household's farming system. FSR was supposed to provide this holistic view of farming systems. Farming is a means to an end, not an end in itself. The ultimate goals of farm households are "happiness, health, and hope, especially for their children" (Rhoades 1994). A related reason for the popularity of the FSR approach in Africa is that there are no effective extension services (York 1987b). FSR is filling this void[3]. Some agricultural scientists might argue that the ineffective extension service is the main reason for the lack of impact on farming systems of resource-poor farmers. In my opinion, the inappropriateness of the technology generated by research is an at least equally important bottleneck.

An example of inappropriate technology is the emphasis on monocropping. Although research and extension had been promoting monocropping for decades, African resource-poor farmers did not adopt this practice, but clung to their 'traditional' intercropping practices. On-station research on intercropping hardly took place in Africa until the early 1970's, although this practice of resource-poor farmers is rational (Norman 1974). Possible advantages of intercropping are: higher and more reliable yields; a smoother labor input profile; better control of weeds, pests and diseases; and a more diverse supply of foodstuffs and other materials (Richards 1985:66). In addition to the fact that intercropping can save land and labor, and contributes to risk spreading, it also minimizes soil erosion, and helps in the maintenance of soil fertility. A variety of ecological factors underlie intercropping practices: spatial and temporal complementarities between crops; inclusion in the mixture of nitrogen-fixing, leguminous crops; more efficient use of fertilizer applications; more favorable micro-climate; and a crop diversity that slows down the spread of pests and diseases (Steiner 1982). The growing interest in the 1970's in farmers' practices such as intercropping, spurred the emergence of FSR.

FSR belongs to a series of agricultural/rural development programs that began in the immediate post-World War II period. The predecessors of FSR were community development projects, the green revolution approach, and integrated rural development projects. According to Oasa (1985) FSR is a logical response to the deleterious socio-political consequences of its predecessor programs, which did not benefit resource-poor farmers. FSR is meant to benefit especially the more disadvantaged farmers (Swindale 1987). Several authors argue that FSR is not new (Fresco 1984; Heinemann & Biggs 1985; Barlow et al. 1986; York 1987b; Chigaru 1987). Good research and extension systems have always had the characteristics of FSR (Biggs & Gibbon 1986). Although it is undoubtedly true that some individuals have done excellent FSR in the past, the colonial research establishments as a whole in Eastern Africa had not been directed to African smallholder farming (ibid.). Apparently, the influence of these few individuals was not large enough to permeate the colonial research systems with a farming systems perspective, which was directed to African small-scale farming. Most contemporary research establishments in Eastern Africa still bear little relevance to agriculture as practised by the large majority of smallholders (this will become clear from the overview of my work experiences in chapter 4); and these smallholders do not have the political power to demand for a research and extension system directed towards improvement of their living conditions.

The second reason for the emergence of FSR is the continuing specialization in agricultural research and education: FSR offers, via *inter*disciplinary work in *multi*disciplinary teams, a

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3. This can create the impression that FSR is mainly an extension activity, which it is not (see section 2.4). In Zambia RELO (Research-Extension Liaison Officer) posts were established to fill the void created by an ineffective extension system. In Western Province in Zambia the RELO formally was an extension staff member seconded to the FSR team, but in actual practice the RELO was an FSR team member fully supported and paid by the FSR team. Although the RELO effectively filled the void, the negative side-effect was that the extension service felt even less inclined to do their job (see section 4.4.6).

possibility to integrate several disciplines[4]. Flach (1989) says that FSR is an attempt to bring within the possibilities of a group of collaborating, young and well-trained specialists what in the past experienced agriculturalists were doing alone. The question remains whether African resource-poor farmers today are best served by highly specialized researchers or more broadly-trained agriculturalists (in chapter 11 we will come back to this issue). For the time being, we conclude that farming as a 'way of life' and the ever-continuing specialization in research -which occurs also in Africa- are conflicting issues.

York (1987b) says that few agricultural scientists today are sons/daughters of resource-poor farmers[5]. Together with their training in highly specialized disciplinary areas this results in little awareness of farmers' problems and needs, which are then not taken into account in the planning and execution of research programs. The ideal is that in the Third World FSR becomes such an integral part of agricultural research that it loses its label or identity -"just as these concepts or approaches have never acquired such an identity in many developed countries" (ibid.).

Reasons why in the Western world FSR never acquired such a prominent position are: 1) Western farmers have the political power to demand for effective research and extension systems. We have to acknowledge, however, that contemporary agriculture in Europe is plagued by persistent problems, which indicates that political power of farmers alone does not guarantee a sustainable development; 2) Western farming takes place on highly specialized farms, while African smallholder farming is still a way of life, not tending towards more simplicity and uniformity, but rather towards increasing complexity and diversity (Frankenberger & Coyle 1993); and 3) Western farmers can easier communicate with researchers and extensionists, because of their higher educational level. In Africa the gap in education between research/extension staff and farmers is larger; farmers' poverty and illiteracy result in differences in status, and hamper communication. In East Africa the combination of the lack of political power, the low educational level of farmers, and the ineffective extension system make that hardly any feedback on farmers' problems to research takes place. FSR, according to its roles defined in section 2.1, should improve on this situation and assist in making research more relevant to the large majority of resource-poor farmers.

The African farmers' lack of countervailing power over research and extension contributed to the emergence of FSR. FSR follows 'marketing research' routines, and provides a 'market' orientation to agricultural research through focusing on specific client groups (Fresco 1986:36; Röling 1988:30). The target categories, that hitherto are not strongly enough empowered to 'pull down' services from research and extension agencies, are named 'recommendation domains' in FSR terminology (see section 5.1: operational problem 10). One can argue that FSR's market research is a (hopefully temporary) substitute for farmers' countervailing power. Ideally, FSR should be a supplement to, rather than a substitute for, farmers' countervailing power. Since many FSR projects in Eastern Africa have been donor-funded, the almost inevitable result after withdrawal of the donor agency is that FSR activities come to a standstill. The continual lack of countervailing power with resource-poor farmers makes that most local researchers return to a minimum set of conventional research activities, which are largely irrelevant to the large target group of resource-poor farmers. Many practical reasons (low salaries, inadequate funds and transport facilities, a

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4. The nouns inter- and multi-disciplinarity and their adjectives are often used indiscriminately in literature. In this study we will speak of 'interdisciplinary collaboration' in 'multidisciplinary teams'. Multidisciplinary teams as such do not guarantee interdisciplinary collaboration.

5. This may be true for Western countries, but not, for example, in Tanzania: see section 4.3.3.

dislike for field work with some researchers, the complexity of on-farm experimentation, and so on) reinforce this trend (see chapters 4 and 5).

Unfortunately, the popularity of FSR in East Africa has been on the decline since the end of the eighties. If FSR wants to avoid the pitfalls of fashion -"to pass from the stage of euphoric adoption, to the stage of critical debate and evaluation, to the graveyard of buzz old words in a very short space of time" (Gibbs 1987)- it will have to reconsider its position (Harrington 1995). The unavoidable decline when unrealistic expectations could not be fulfilled, has started. Although FSR practice could not -and still does not- match the rhetoric, the FSR theory and methodology do make sense. It would be unfortunate when FSR would gradually disappear, instead of permeating the East African agricultural research systems to a larger extent than is the case at present. According to Dent & McGregor (1994), however, the interest in the application of FSR methodologies is nowadays on the increase in Europe. In an article on FSR in the European context Spedding (1994:51) says that public concerns about the environment, animal welfare and genetically manipulated products represent outputs that:

> "produce feedback effects on the system itself. ... No system can be regarded as completely described if it takes no account of public reaction to its processes and products (including pollution), where this is powerful enough to change the system, by legislation, social or economic pressure".

Promotion of the FSR approach in Europe is a way to ensure that the direction of change is supportive of rural people and their overall environment (biophysical, economic and social) (Dent & McGregor 1994:xvii). Furthermore, the FSR approach has the potential to reduce non-renewable resource use in European agriculture because of its emphasis on exploitation of component interactions under farm conditions, and its participative nature results in finding solutions more quickly (Leaver 1994:60).

2.4 Conceptual confusion

If FSR wants to challenge conventional agricultural research, first of all clarity in its concepts is required. The different interpretations of the holistic, interdisciplinary and location specific aspects of FSR result in considerable conceptual confusion. Also differing opinions on the roles of FSR contribute to conceptual confusion (Birgegard & Fones-Sundell 1987).

The interpretation of the term 'holistic' is probably the main source of confusion in FSR. Plucknett et al. (1987) refer to the "often fuzzy and seemingly all-embracing nature" of many FSR programs. In most FSR programs the holistic approach entails that in the diagnostic phase the *whole* farm system serves as a framework for analysis, but in later stages only specific components, subsystems or interactions are targeted for intervention (Merrill Sands 1986; Norman et al. 1994:9). The selection of these intervention points is one of the problematic areas in FSR (as will be shown later on: see the operational problems 1, 6, 8 and 13 in section 5.1). A main problem with the holistic aspect of FSR is the delineation of the system under study: what are the boundaries of the system? In the early days 'holistic' meant a breakaway from a monocropping focus to intercropping, then to cropping systems research, subsequently crop/livestock systems and off-farm activities were included, and finally agricultural sector, national economy and world economy issues were also thought to be of importance for a holistic FSR approach. Many FSR efforts, however, never rose above the study of cropping systems (Birgegard & Fones-Sundell 1987). The focus on individual farm units often ignores important structural and/or macro-economic factors. Systems thinking, despite lip-service to holism, is still the exception rather than the rule (Gibbs 1987; Berdegué 1993; Baker 1993; Sevilla Guzmán et al. 1994; Bawden 1995).

Also the multi-disciplinary and location-specific aspects of FSR can be defined in various ways. Does a multi-disciplinary team only consist of natural scientists or are social scientists included as well? With respect to location-specificity, one can ask whether only agro-ecological, or also economic and socio-cultural criteria are used to delineate a domain? Finally, there are several roles that FSR can play: is it only a descriptive study of a farming system, or is it a method to run, via feedback channels, an entire national agricultural research system? Diagram 4 shows the multitude of options available when defining the FSR concept (Birgegard & Fones-Sundell 1987)[6]. Moving from the inner to the outer circles in Diagram 4, the system expands and the FSR concept becomes more holistic, multidisciplinary and location specific, and with more roles imbedded in the definition of FSR. Although the analysis becomes more relevant, there are far reaching consequences in terms of methodological complexity, interdisciplinary communication problems, skill requirements, and organization and management. The concept becomes more demanding in all these respects, and demands on institutions and personnel applying the approach will rapidly increase. This raises serious doubts about its practicability.

The ambiguity in the conceptualization of FSR is partly due to the continuing evolution of the concept: it is still relatively new. Another reason is that FSR became a ‘catch-all’ term (Merrill Sands 1986). Any research that did not fall within the conventional categories of commodity- and discipline-oriented research, was named FSR. Four primary areas of ambiguity in the conceptualization of FSR (which partially overlap with the four sources of confusion mentioned here above by Birgegard & Fones-Sundell) can be distinguished (ibid.):

1) *Precision in the use of the concept*. The most narrowly conceived concept is one of true systems analysis (detailed quantitative modelling of an existing farming system). The most broadly conceived concept is a farming systems program which integrates agricultural research and development strategies. The Francophone approach to FSR is such a broadly conceived strategy: agrarian infrastructure and services are not treated as parameters, as in most Anglophone FSR, but as variables (Fresco 1986; Huijsman & Budelman 1996).

2) *Definition of the boundaries of the system under analysis*. The definition of the boundaries of a system is a fundamental step in systems analysis. The decision which factors to treat as endogenous variables (under farmers’ control) and which as exogenous parameters (not under farmers’ control), is often a dilemma to researchers. The distinction between exogenous parameters and endogenous variables may be difficult to maintain, especially in communities with a high degree of social interaction (Maxwell 1986a). FSR, which basically is a hard systems theory, neglects the fact that the delimitation of systems’ boundaries is a subjective process (Brouwer & Jansen 1989). Many advocates of hard systems theory and FSR acknowledge this, but only in short additional notes: it does not really affect the application of systems theory. Norman & Collinson (1985) say:

> “As long as the concept of the whole farm and its environment is preserved, not all the factors determining the farming system need to be considered as variables - some may be treated as parameters”.

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6. The positioning of various aspects of FSR within one circle in Diagram 4 does not imply that they are related. The diagram just intends to show that the definition of the various aspects of FSR can range from very narrowly conceived to very broadly conceived.

The important question is then *how* to continually preserve the farming systems perspective? (we will return to this question later on).

3) *Level of specificity employed to define a farming system*. Different criteria can be used to classify farming systems into domains[7] (see Diagram 4).

4) *Level of socio-economic analysis incorporated*. To date a strong technological bias prevails in research institutions. Many researchers in Eastern Africa regard it the responsibility of extension and development agencies to demonstrate the utility of an 'improved' technology to farmers or, even worse, to adjust farmers' circumstances to accommodate the technology. All this ambiguity and confusion makes clear how easily FSR can degenerate into a 'fuzzy' concept.

With respect to the different roles of FSR, as shown in Diagram 4, one can wonder whether On-Farm Research (OFR) -which constitutes only one component of FSR- should have as its main purpose technology generation, technology verification, or technology extension (Barker & Lightfoot 1985). It is my experience that many scientists in Eastern Africa consider technology verification and extension the main purpose of OFR, often without acknowledging the crucial feedback role to On-Station Research (OSR). The frequently encountered blending of research and extension objectives in on-farm trials is an indication of the tendency to consider extension a main purpose of OFR. Swindale (1987), for example, says that OFR is often as much demonstration as it is research. I feel that a clear distinction between on-farm extension (demonstrations) and on-farm research (experiments, trials) is desirable[8].

7. Three types of domains -linked to the sequence in the FSR process- can be distinguished: research domains, recommendation domains, and diffusion domains (Wotowiec et al. 1988). Research domains should be narrowed to a farming systems typology (Moore 1995).

8. CIMMYT distinguishes three types of on-farm experiments: exploratory, determinative and verification experiments (Collinson 1987a). Norman et al. (1994:11,83) distinguish between Researcher Managed-Researcher Implemented (RMRI) trials (exploratory trials; equivalent to on-station trials), Researcher Managed-Farmer Implemented (RMFI) trials (determinative trials), and Farmer Managed-Farmer Implemented (FMFI) trials (verification trials). If researchers would use this classification to indicate in which stage of the on-farm experimentation sequence the on-farm trials are at a certain moment in time, then confusion about the purpose of trials could be avoided, for on-station researchers as well as for farmers. Although the level of involvement of extensionists increases in these three types of on-farm experiments, the main purpose of verification 'experiments' remains research, not extension. I agree with Norman (1994) that a lack of specifications regarding on-farm trials is one of the main factors that contribute to misunderstandings between FSR practitioners and on-station researchers. Recognition of the complementarity between on-station and on-farm research will be more easily forthcoming, when the differences in roles of the various types of trials are understood and acknowledged.

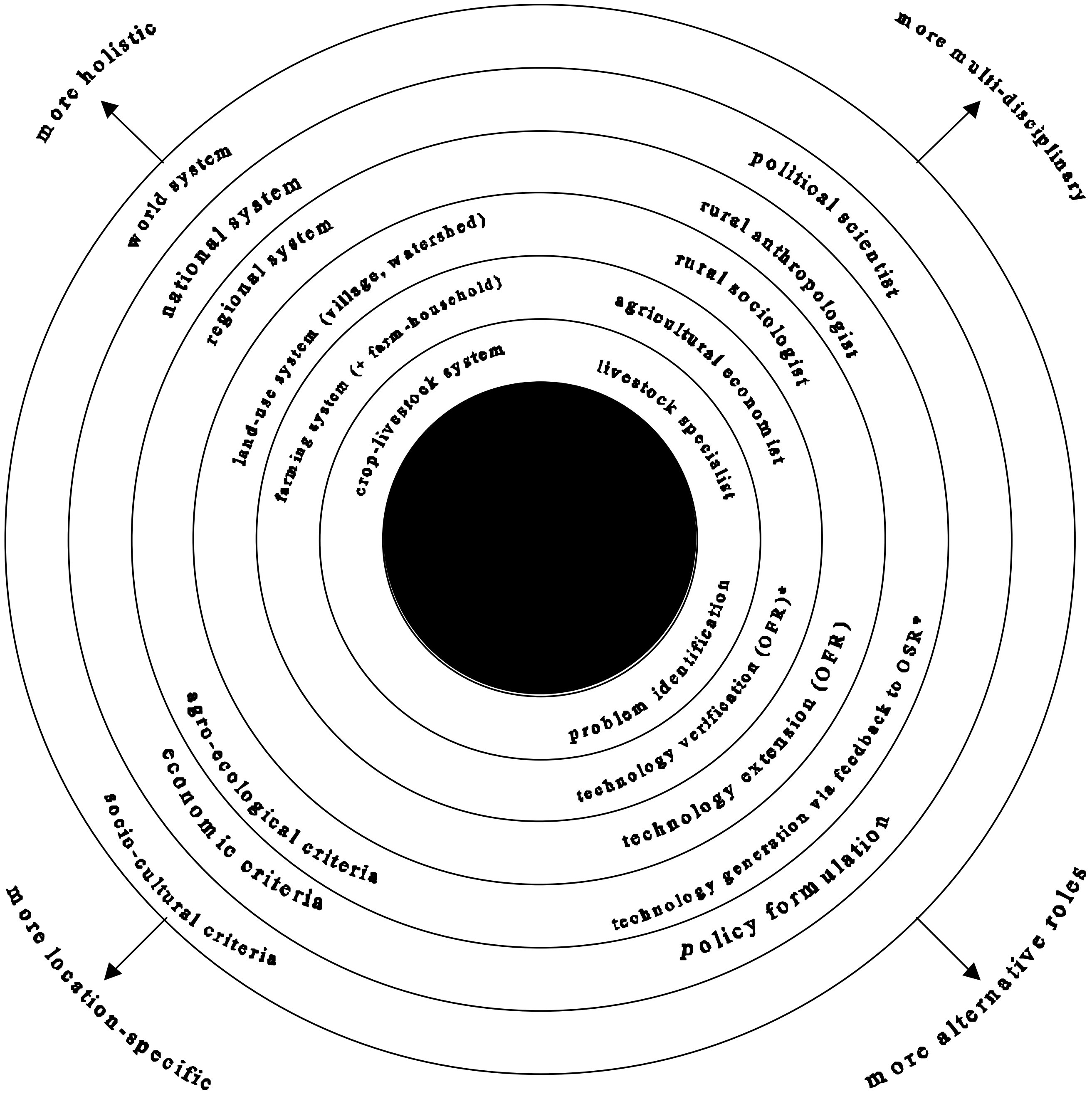

Diagram 4: Defining the FSR concept
(adapted from Birgegard &Fones-Sundell 1987)
(* fs = farming system,
OFR = On-Farm Research,
OSR = On-Station Research)

2.5 The use of models in FSR

In this section some remarks on the use of systems analysis techniques in agricultural research, and more specifically in FSR, will be presented. First of all, it is important that modelling does not become an end in itself. Many modellers promise more than they can deliver, and relatively few models are actually used in decision making (Maini 1987). Box (1988) even speaks of 'system-addicts' at the technical departments of universities. For socio-agronomic research formal systems analysis is often needlessly complicated, too pretentious and it does not guarantee an improvement of communication between farmers and researchers. A holistic approach even can become a hindrance because too many variables are included in the model with the consequence that one loses sight of the specific problem (ibid.:1989). In large-scale modelling exercises key issues and questions "tend to be obscured by a preoccupation with the details of construction" (Conway 1985a). Simmonds (1985:21,84) says:

> "In real life ... systems isolated for study are always subsystems arbitrarily defined for the purpose in view. They are never holistic in any serious sense of that rather over-used word. In practice, what is wanted is sufficient understanding to attain the necessary level of FSP [Farming Systems Perspective] and no more. I wish the words holism and holistic were avoided in FSR contexts except when a really deep analysis of a whole-farm system is being attempted, that is, FSR 'sensu stricto'. ... For OFR/FSP [On-Farm Research with a FSP] a partial, non-holistic, subsystem knowledge will suffice or, anyway, has to suffice in practice. ... FSP rightly takes a common-sensical rather than a formal view of systems and, only exceptionally, needs to make numerical models. ... A system is what an experienced worker says it is".

The assertion that an experienced worker does not need numerical models, is in line with Maini's (1987) remark that successful practitioners of systems analysis pursue it more as a 'craft' than as a science.

Collinson (1981) -one of the founding fathers of FSR in Eastern Africa- remarks that modelling of the real world is too complex for the techniques that we have at our disposal, and that "mathematical programming cannot effectively represent real life situations" (ibid. 1982:46). In the field of FSR the use of sophisticated modelling techniques for systems analysis is not worth the extra cost (ibid. 1982;1985). The opportunity costs of the additional professional time, required for detailed data collection, are too high, and the level of control of enumerator and respondent error is usually poor. Instead of detailed measurement of the input and output coefficients on a limited number of farms, the scarce professional time is better spent on a wider coverage of the smallholder sector (ibid. 1981). The necessary initial understanding of farming systems can be obtained through low-cost exploratory surveys. This understanding is in fact "a prerequisite to building useful models which, at best, can improve that understanding" (ibid.).

Simulation models may exclude many persons from the analysis, because of "a lack of skill or inclination to interact with the model" (Conway 1985a). Struif Bontkes (1991:97) says at the end of a publication on an interdisciplinary simulation study of a rural area in Southern Sudan:

> "..the modeler may easily be carried away by his work behind the computer and so detaching him more and more from the real situation. ... the model is just a subjective representation of reality.. It should, however, be realized that there will be many factors, that are not included in the model, but could nevertheless play an important role in [decision making]. It is therefore important that methods be

> developed that facilitate interaction between modelers and target group and so enabling a more participatory approach".

Unfortunately, such methods are not (yet) available. In my view, it will not be easy to develop effective communication and genuine participation with local, illiterate resource-poor farmers on the basis of formal models. Computer simulation can never substitute the direct contact between farmers and researchers (Fresco 1984). With regard to the interaction between modelers and resource-poor farmers, it can be argued that the tool of interaction should be compatible with the farmers' preferred learning style (Hamilton 1995:94). Farmers clearly prefer tangible rather than abstract tools[9].

Computer-based simulation modelling makes it possible to include factors at other levels than crop or farm level in the analysis (Fresco 1984). Computer models can facilitate, for example, the determination of the effect of changing price relations on farm productivity, but hitherto no other factors than agro-technical and economic ones have been included in models. Highly sophisticated modelling certainly has a role to play in the rural development process, but at the same time direct contact with resource-poor farmers, solid field experience, and informal, intuitive operation are important. Especially in the East-African context, the uniqueness of each farm-household must be born in mind. The large variation in space and time of East African farming systems -the large diversity between, and even within, fields, and the intra- and inter-seasonal changes in climatic factors- make it difficult to capture farming systems in modelling exercises.

The systems approach in general concentrates on interrelations or interconnections; it is a dynamic approach that considers processes as more fundamental than structures. Bawden (1995) argues in an article on the systems dimension in FSR that FSR is more systematic than *systemic* - "more concerned with the rigour and linear logic of the process, than with the systemic interconnections of either the object of the research or the process used". In order for FSR to become a truly participative research approach, the capacity of FSR practitioners to think and act systemically must be improved: they need to learn how to learn about *being systemic* (ibid.). Sustainable development requires systemic competence, expressed in a systemic perspective which portrays "the sense of wholeness in all of this" and which promotes the participation of all relevant stakeholders in the rural development process (ibid.). Here sustainable development, *being systemic*, and full participation are interconnected. We will return to these issues later on.

2.6 Conclusion

In this chapter the first learning about F (FSR theory) and M (FSR methodology) took place (see Diagram 2 in chapter 1). The conclusion is that FSR theory makes sense, although conceptual confusion continues to plague the FSR concept. The basic FSR methodology is a relatively simple, straightforward approach to plan and implement on-farm research, and to provide feedback to on-station research and the policy arena.

In addition to the complexity of farming systems of resource-poor farmers, also the centrality of the human factor is emphasized in this study. Farming as 'a way of life' requires a farming *systems* perspective, and is at odds with the ever-continuing specialization in research. The claim of FSR to

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9. In order to improve interaction and communication between researchers and Australian farmers, Hamilton (1995:94) recommends to make computer programs more tangible by incorporation of pen and paper calculations.

be a holistic approach will feature as a prominent issue in this study. FSR is, first of all, a scientist's attitude towards agricultural research.

Different interpretations of the holistic, interdisciplinary, and location specific aspects of FSR, and differing opinions on the roles of FSR, result in conceptual confusion. These various areas of ambiguity in the conceptualization of FSR result into a 'fuzzy' concept. The practicability of a comprehensive FSR concept remains problematic. Hitherto, FSR has been more systematic than *systemic*. Although FSR is based on systems thinking, systems thinking is still the exception rather than the rule. Most FSR practitioners are not in favor of formal modelling exercises, and consider it important that modelling does not become an end in itself, and does not frustrate effective participation of resource-poor farmers. The lack of political power with resource-poor farmers, resulting in research and extension systems which are not geared towards their conditions, makes explicit attention for farmer participation indispensable.

In the next chapter an analytical perspective for the interpretation of my work experiences and FSR literature will be presented.

3 ANALYTICAL PERSPECTIVE FOR INTERPRETATION OF WORK EXPERIENCES AND LITERATURE, AND FOR SELECTION OF MAIN ISSUES

3.1 Introduction

In the chapters 4 and 5 I will present an overview of my work experiences and a review of FSR literature successively. The many operational problems encountered in work experiences and FSR literature are then clustered around four main issues: holism, interdisciplinarity, attitudinal factors, and lack of countervailing power. The selection of these four main issues is an important step in this study, which demands transparency. The holistic and interdisciplinary aspects of FSR contribute to confusion at the conceptual level (section 2.4), and, therefore, the issues holism and interdisciplinarity are bound to be focal points in the clustering of operational problems. Attitudinal factors and lack of countervailing power, however, are less obvious choices as main issues. Especially the selection of these last two issues requires further clarification.

In section 1.4 I have argued that all observation, interpretation of data, and practical action are theory laden: they are linked up with worldviews. There are no uninterpreted facts. The knowledge development process is self-referential (Vicari et al. 1996)[1].

> “We have to recognize (...) that any endeavour to ground the rationalism of science within the structure of science as such finds itself in a logical circle. But this is only a vicious circle if its closing is treated as an end-point of enquiry, rather than as a beginning. There is no way of justifying a commitment to scientific rationality rather than, say, to Zande sorcery [magic and witchcraft among the Azande ethnic group], apart from premises and values which science itself presupposes, and indeed has drawn from historically in its evolution within Western culture” (Giddens 1976:139-40: in:Leeuwis 1993:100).

Since worldviews cannot be choosen on scientific grounds, I have given in section 1.4 a preliminary characterization of my worldview. In the same section I have indicated how impact of worldview bias can be reduced[2]. In order to further clarify my interpretation of work experiences and FSR

1. “Self-referentiality means that new knowledge refers not only to past knowledge but also to potential future knowledge. Thus, we use our existing knowledge to determine what we see, and we use what we already know to choose what to look for in our environment. The way to change the environment is to develop knowledge through additional different distinctions (extension) and make new, finer distinctions (refinement). If we imagine the organizational knowledge structure as a tree, the former would represent a different thick branch next to the root, the latter a little thin branch evolving from an existing thick branch. ... We are particulary interested in knowing how and when to encourage the creation of new refining and extensional distinctions. Given that the knowledge development process is self-referential, the answer is not obvious” (Vicari et al. 1996). As a preliminary position, I argue that we also might develop new knowledge by looking for the root of the tree. The root of the tree of knowledge might be based in pure, transcendental consciousness (see chapters 8 & 9).

2. Although in section 1.4 I have argued that participatory interpretation by others can reduce biases in the interpretation of my work experiences, such external criticism is difficult to realize in the case of location-specific FSR activities. With reference to the production of knowledge Colin (1994) remarks: “This brings up to the key question of how far one has to go in empirical observation to avoid these pitfalls [the risks of misunderstanding farmer behavior and farming systems performance]. Or, to put it differently, how can we know that we have reached a satisfactory explanation ? It is always possible to build a coherent explanatory model, whatever our knowledge of the situation - even if it remains very superficial. But it is also possible to progress toward more satisfactory (complete) explanations - under the stimulus of better empirical knowledge, and under the pressure of external criticism. Unfortunately, in our field of study characterized by locally specific research, little can be expected from peers’ criticisms when the researcher handles (consciously or not) the art of rhetoric, except when

literature, to make the ensuing selection of main issues as transparent as possible, and to elucidate the construction of the transcendentalist paradigm which can help to clarify these main issues, in this chapter I will present an analytical perspective.

Knorr-Cetina (1981) argues that in the social and natural sciences a continual interaction between theoretical exploration and empirical investigation takes place. My practical work in East Africa and the subsequent theoretical reflection on main issues in FSR followed this normal path of scientific investigation. A rhythmic play between cognition- and choice-processes -between understanding the world and changing the world, between *why* and *how* questions- took place (Diagram 1: section 1.2)[3]. Since I can never detach myself completely from analytical perspectives, I have explicated in section 1.4 some of my predispositions. One of these points of departure is my belief that societal changes are rooted in the (collective) behavior of individuals. At the end of the day, it are individuals who play a pivotal role in processes of rural development, and thus also in FSR. This point of departure leads me to the ‘actor-structure debate’ - an important and long-standing debate in the sociology of rural development which focuses on the relation between ‘actors’ (human action) and ‘structures’. The actor-structure debate deals with the dualism between actor and structure, micro-level behavior and macro-level structures, voluntarism and determinism. The actor-structure debate, in turn, cannot be understood without the attitude-behavior models as developed in social psychology. These two issues -the actor-structure debate and attitude-behavior models- will be the main points of attention in this chapter.

In this study I focus on the attitudes, worldviews, knowledge and practices of FSR practitioners and other agricultural researchers (but other stakeholders in the process of rural development are certainly not excluded). It is important to recall that one of the main conclusions in chapter 2 was that FSR is, first of all, a scientist’s *attitude* towards agricultural research. Moreover, it is the lack of countervailing power with resource-poor farmers -the absence of strong farmer organizations- which contributed to the emergence of FSR (section 2.3). Attitude-behavior models and the actor-structure debate might elucidate these two important issues in FSR.

I realize that a focus on ‘attitudes’ in the context of a scientific study on FSR is uncommon, but, on the other hand, attitudes and behavior are frequently mentioned in FSR literature (section 5.1). Unfortunately, attitudinal factors are often mentioned without explicit attention for measures to be taken to overcome attitudinal blocks. But the pivotal position of attitudes is beyond doubt. Huijsman & Meindertsma (1994), for example, say that three essential features of FSR -interdisciplinary research, farmer participation and involvement of other actors- proved difficult to deal with in practice, and require new attitudes.

> “Learning to create linkages and work participatively -seeing FSR&D as a node within a network of actors- will require learning new skills and, perhaps even more importantly, new attitudes; it is also time consuming” (ibid.).

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those peers have sufficient knowledge of the situation under study to question a weak but coherent explanation. Thus our question remains unanswered, for there are no norms, no recipes allowing one to define ‘ex ante’ or to evaluate ‘ex post’ the appropriateness of a researcher’s fieldwork investment - apart from an ‘ex post’ subjective evaluation of the researcher him/herself”. In addition to the elaboration on my worldview in chapter 3, a review of FSR literature in chapter 5 will help to put the ‘ex post’ subjective evaluation of my work experiences into perspective.

3. Although both ‘why’ and ‘how’ questions deserve adequate attention, agricultural researchers (and in particular FSR practitioners) tend to focus on ‘how’ questions, and neglect ‘why’ questions (section 1.2). In this study the ‘why’ question figures as the main research question.

Pretty & Chambers (1994) advocate a new agricultural professionalism about which they remark:

> "Personal behavior and attitudes remain the great blind spot of agricultural research and extension. The quality and sensitivity of personal interactions are critical. ... Methodologically, a major frontier for institutional change is how first to enable individuals to change, for personal change will often have to precede as well as accompany changes in the cultures of organizations".

Röling (1988:66) distinguishes two sets of variables which can have an impact on the adoption of new technology: structural variables (at the societal level) and socio-psychological variables (at the individual level). The non-adoption of new technology can be blamed on inadequate structural variables (e.g., an ill-functioning input delivery service) or on individual characteristics of farmers (e.g., 'conservative' or 'ignorant' farmers) or on both. In health-extension and education these two extreme positions have been labelled 'system blaming' and 'victim blaming' successively (Van Eijk 1986). On first thoughts it seems probable that truth lies midway, but it is important to realize that the 'building blocks' of any structure are individuals. The essence of the societal process is the individual (Fromm 1941). Progress is only possible when changes occur simultaneously in the economic and socio-political dimension (structural variables) *and* in the cultural dimension (socio-psychological variables), and a progress limited to one dimension is destructive to progress in all dimensions (Fromm 1955:10). The essential point, however, is that also changes in structural variables are made by (a collective of) individuals.

With regard to 'structures' such as research and extension agencies in East Africa, it is important to note that such agencies are part of government bureaucracies, which are characterized by incentive structures that do not promote client orientation. Measures such as training or "an appeal to moral principles" do not easily induce responsiveness to the public (Röling 1988:151). As long as FSR and other Farmer Participatory Research methodologies depend on the voluntarism or altruism of scientists to be responsive to resource-poor farmers, public sector research organizations will not be supportive of the large majority of the farming population (Röling & Fernandez 1990; Merrill-Sands & Collion 1993). In order to move beyond altruism and to develop truly farmer-responsive research, resource-poor farmers must organize themselves and gain the political and financial power to put pressure on government services for improved relevance and performance (Simms & Leonard 1990; Röling 1990; Sperling & Ashby 1992; Merrill-Sands & Collion 1993). FSR should be a supplement to, rather than a substitute for, farmers' countervailing power (section 2.3). The power of target categories to counterbalance "bureaucratic convenience, self-serving behavior, lack of client orientation and other ills of one-sided intervention structures" is a necessary, but much neglected condition for development (Röling 1988:150). Rural development, says Röling (ibid.), occurs within the *dynamic balance* of power and countervailing power.

> "..improving the impact of research and extension [is] not so much a question of strengthening the intervention power of extension or the information generating power of research, but more a question of designing systems in which intended utilisers could exert 'countervailing power' over extension and research" (ibid.:32).

An important question is then *how* to maintain this *dynamic balance* of intervention power of change agents (researchers, extensionists, input and credit suppliers, marketing boards, private traders, and so on) and countervailing power of resource-poor farmers (we will return to this issue).

Most likely the level of farmer participation in agricultural research will continue to increase (either enforced by farmers' countervailing power or otherwise). The central position of the farmer is becoming evident in approaches such as Integrated Pest Management (IPM) and Integrated Nutrient Management (INM), in which agricultural professionals help farmers to become experts at adaptive management (Röling 1997). In 'adaptive management' approaches (Holling 1995) professionals can no longer rely on blanket recommendations, but develop *with* farmers a basket of possible approaches. In sustainable agriculture, characterized by diversity and local specificity, farmers are *the experts* who manage their crops and soils. They do not just follow recommendations, but apply principles in diverse situations (Röling 1997). Since this requires a fundamental change in the thinking and acting (attitude and behavior) of researchers and extensionists, attitude-behavior models might be of interest in the transformation to a sustainable agriculture.

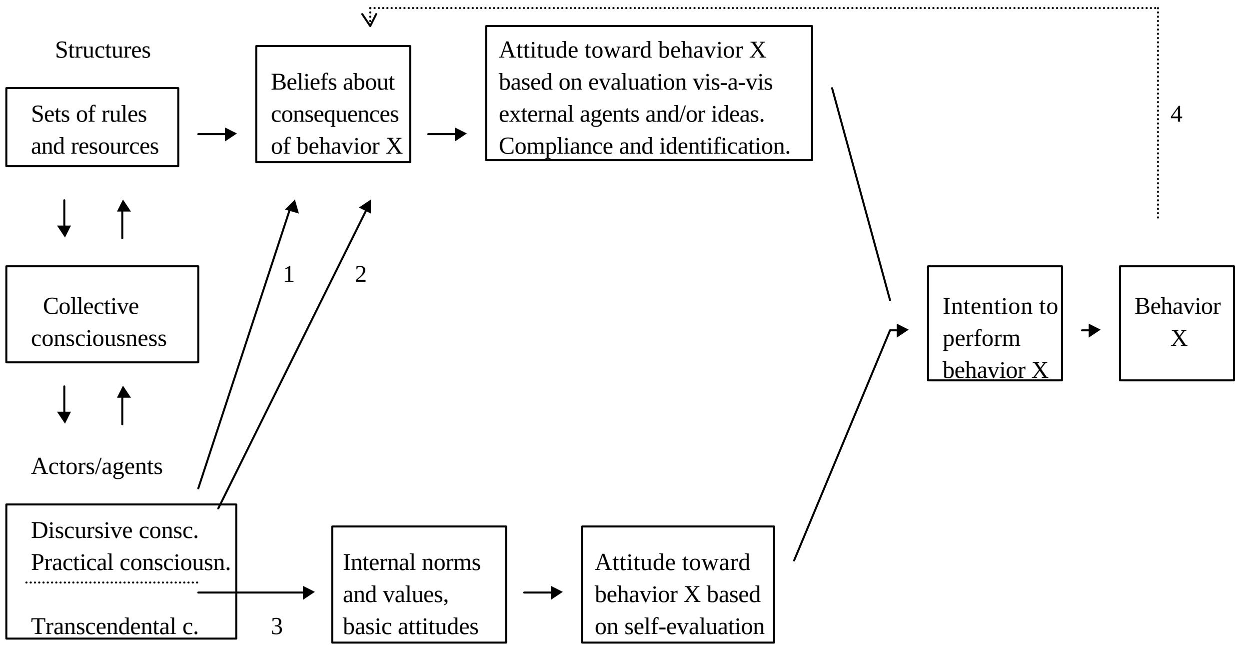
3.2 Attitude-behavior models

In his thesis on the ecological modernization of modern industrial society, Spaargaren (1997:1) pleads for a modernization both at the institutional level and at the level of strategic human behavior. In his view the ecological modernization should not be actor-driven *or* system-imposed, but both at the same time (ibid.:29). He emphasizes the interplay between action and structure. In our natural science dominated scientific community social scientists are hitherto only assigned a place at the periphery where they, as 'social engineers', are expected to come up with means to change the behavior of the population in order to solve our environmental problems (ibid.:i). This is a difficult task for social scientists. In the literature on attitude-behavior models one can find a nearly inexhaustible variety of conceptual schemes, which are all elaborations or refinements of the Fishbein-Ajzen behavior model (ibid.:127). In Diagram 5 I have depicted a conceptual framework, which is a combination of the original Fishbein-Ajzen model (1975) and the 'action model' of Spaargaren (1997:144). For the construction of Diagram 5 I have adapted both models slightly, but without leaving out essential characteristics. The differences between these two models and my model will be indicated later on. In order to elucidate how I combined the two models in my Diagram 5, I have depicted in the Diagrams 6 and 7 the original Fishbein-Ajzen model and the 'action model' of Spaargaren successively (Spaargaren's model in Diagram 7 is adapted in the sense that consumer practices have been replaced with the agricultural social practices of a farmer). Two examples of possible 'behaviors' are given in Diagram 5: the agricultural social practices of a farmer, and the social practices of a FSR practitioner. The (incomplete) set of activities, which together constitute a behavior, are called *social* practices, because they are performed in conjunction with others. In the remaining part of this chapter I will elaborate on Diagram 5.

Fishbein & Ajzen (1975) distinguish among beliefs, attitudes, intentions and behavior. They suggest a classification consisting of the following four categories: belief or cognition (opinions, beliefs, information, knowledge), attitude or affect (feelings, evaluations), intention or conation (behavioral intentions), and behavior (actual behavior, observed overt acts). Unfortunately, the concept 'attitude' is characterized by an embarrassing degree of ambiguity and confusion, and few investigators agree on an explicit definition of attitude (ibid.). To my mind a workable characterization of the concept 'attitude' is given by Petty & Cacioppo (1986:4), who say that attitudes are general evaluations people hold in regard to themselves and other people, and to objects and issues. Thus, attitude is evaluative or affective in nature. The attitude toward performing a given behavior is related to the beliefs that performing the behavior will lead to certain consequences, and to the evaluation of those consequences. In the original Fishbein-Ajzen attitude-behavior model and its derivatives ‘attitude’ consists of two components: a motivational component based on the individual’s assessment of the consequences of different behavior options (the upper route in Diagram 6), and a normative, social norm-related component based on the individual’s assessment of the wishes and demands from the social environment (the lower route in Diagram 6) (Spaargaren 1997:127). Some examples of consequences of behavior are monetary rewards and punishments (the above mentioned motivational component of attitude), and social approval or disapproval, i.e., the social pressure to perform or abstain from performing a behavior (the normative, social norm-related component of attitude).

In order to clarify the distinction between beliefs and attitudes, I refer to Allport (1958:13) who distinguishes between the attitudinal and belief aspects of prejudice. Prejudice contains an attitudinal factor of favor or disfavor, and an overgeneralized (and therefore erroneous) belief factor. The statement ‘I don’t want to collaborate closely with resource-poor farmers’ expresses the attitudinal factor, while the statement ‘resource-poor farmers are ignorant and conservative’ expresses the belief factor. The distinction between attitude and belief is useful, because attitudes can be much harder to change than beliefs. In a process of rationalization -of accommodation of beliefs to attitudes- “the belief system has a way of slithering around to justify the more permanent attitude” (ibid.:14).

For effective FSR it is essential that long-held stereotypes about resource-poor farmers are overcome, which demands more than changes in behavior. Attitude is not the same as behavior. Behaviors of researchers and extensionists can change without attitudes being changed, for example through the use of external force. Behavior and attitude are the outer and inner side of an individual’s personality: one could say that attitudes are ‘internalized’ behavior. For example, a donor agency can put pressure on local researchers (through allocation of funds and scholarships) to change their behavior, i.e. to implement research which is more relevant to resource-poor farmers. As soon as the donor agency withdraws, the researchers might revert to research focused on ‘progressive’ farmers, because their attitudes did not really change. In this example the beliefs about the consequences of their behavior might have (temporarily) changed, as well as their attitude toward that behavior based on an evaluation vis-à-vis an external agent, i.e., the donor agency. The donor agency ‘enforced’ a temporary change in attitude. As long as the external ‘pressure’ is there, the researchers will comply with this ‘force’. The upper route in Diagram 5 is followed.



Two examples of behavior

Social practices of a FSR practitioner	Agricultural social practices of a farmer
- collaboration with resource-poor farmers	- land preparation
- design on-farm trials	- planting
- implement trials	- weeding
- analysis of trials	- harvesting
- publish results	- marketing
- social contacts, leisure	- off-farm work
- etc.	- social contacts, leisure
	- etc.

- Arrow numer 1 represents a process in which evaluation of externally provided data and information (beliefs about consequences of certain behaviors) takes place at the level of the discursive consciousness. It is a process of conscious selection, in which information is not (yet) deeply internalized.
- Arrow number 2 represents a process in which evaluation takes place at the level of the practical consciousness. It is a less conscious, more automatic process. In this routine-based process information is more deeply internalized.
- Arrow number 3 represents a process in which 'life-supporting' internal norms and values (basic attitudes) spontaneously emerge at the interface of the practical and transcendental consciousness.
- Arrow number 4 represents a feedback process which, to my mind, is unlikely to occur at a significant scale.
- It might be that information which has been several times evaluated at the discursive level moves to the level of the practical consciousness, and follows then arrow 2. Internalization is a black-box process.
- Above diagram is an attempt to an ideal-typical model for analytical purposes. In actual practice the upper and lower routes apply simultaneously.

Diagram 5: Conceptual framework relating actors, structures, attitudes, and behaviors
(adapted from Fishbein & Ajzen 1975 and Spaargaren 1997).

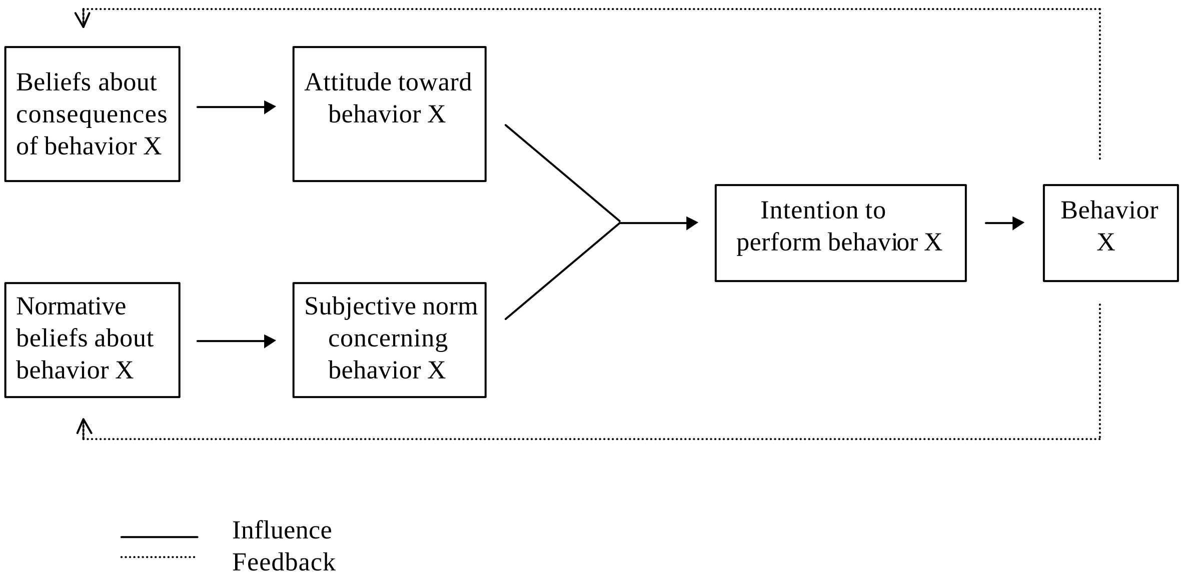


Diagram 6: Schematic presentation of conceptual framework relating beliefs, attitudes, intentions, and behaviors (Fishbein & Ajzen 1975).

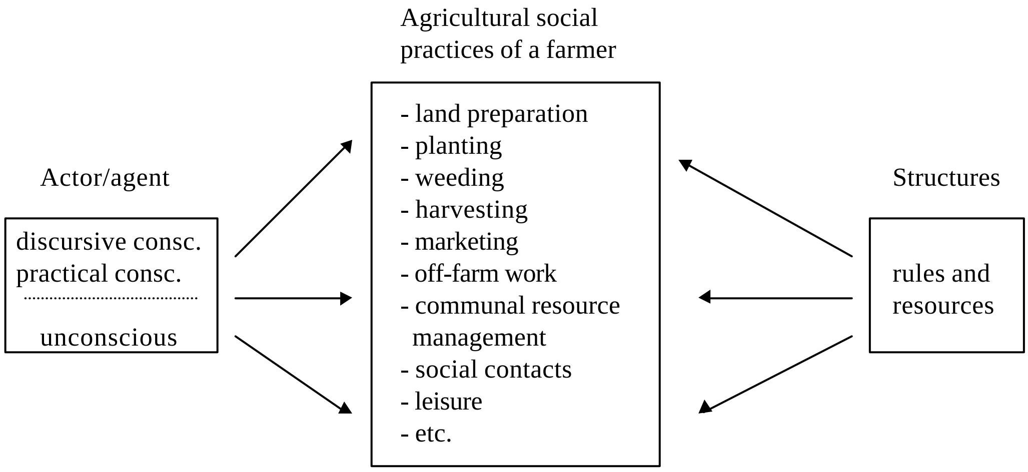


Diagram 7: Sketch of an 'action model' derived from structuration theory (adapted from Spaargaren 1997: 144).

Schwartz (1977) developed a theory on altruism, in which personal standards or norms evoke feelings of moral obligations that result in altruistic behavior. Altruistic behavior is an expression of internal values without regard for the network of social and material reinforcements (Schwartz 1977: in Groen 1995:63). In this theory the anticipated moral costs and benefits of actions -in relation to one's self-evaluation- are important. This self-evaluation is an evaluation not vis-à-vis external agents or ideas, but vis-à-vis internal norms and values. In Diagram 5 this attitude toward a certain behavior based on self-evaluation, or an evaluation people hold in regard to themselves (Petty & Cacioppo 1986), is depicted in the lower route[4]. In this aspect my model differs from the original Fishbein-Ajzen model, which includes a social norm-related component of attitude, but no individual, internal norm-related component. The earlier mentioned motivational and social norm-related components of attitude in the Fishbein-Ajzen model (the upper and lower routes in Diagram 6) are in my model combined in the upper route, since both these components are based on an evaluation vis-à-vis external agents or ideas[5]. These evaluations people hold in regard to other people, and to external objects and issues. In addition to the earlier mentioned monetary rewards, and sanctions based on law and social pressures, other (related) examples are power and countervailing power, and morality which is imposed from outside (e.g., by churches). When in the example which I presented in the previous paragraph, resource-poor farmers would have gained enough countervailing power to demand for relevant research, then the upper route in Diagram 5 would have applied. Researchers would have to comply with the wishes and needs of this client group, as long as the countervailing power of the farmers would be adequate. When, however, monetary rewards are virtually absent (very low salaries) and intervention power and countervailing power are not effective (the power of the top management of research and extension organizations to influence events is small, the external pressure of donor agencies is only temporary, and countervailing power of farmers is lacking), then the mechanisms of the upper route fail. The attempt to move beyond the voluntarism or altruism of scientists to be responsive to resource-poor farmers (section 3.1) has failed. What about the lower route, the 'altruistic' route?

Van Woerkum (1990) makes a distinction between voluntary and non-voluntary (or compulsory) behavior, and between 'externally motivated' and 'internally motivated' voluntary behavior. An example of compulsory behavior is behavior enforced by laws and regulations, people are coerced into compliance; an example of externally motivated voluntary behavior is behavior 'enforced' by group pressure; and an example of internally motivated voluntary behavior is behavior realized through the influencing of reasoned opinions by extension. Röling (1988:44), on the other hand, makes only a distinction between non-voluntary and voluntary behavior. The two determinants of *non-voluntary* behavior are compliance and identification: *compliance* with rules and regulations, which are enforced "through a system of surveillance and incentives", and *identification* with others by the mechanism of social control (ibid.). Changes in *voluntary* behavior can only be induced by communication interventions, such as advertising, PR, political propaganda, publicity and extension, and not by compliance and identification (ibid.). According to Röling (ibid.:43) extension is not a very powerful instrument, but it is the only instrument available to influence voluntary behaviors, i.e., behaviors that are enacted in the absence of surveillance and incentive structures. Leeuwis (1993:64) says that the social psychological approach in extension, in which 'beliefs', 'subjective norms' and 'attitudes' are seen as determinants of behavior, starts from "a rather reactive and

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4. The term 'self-evaluation' is a bit ambiguous. The 'evaluation' vis-à-vis one's own internal norms and values is not a discursive, conscious process. It takes place at the borderline of transcendental and practical consciousness, at a very refined level of consciousness, and is therefore not comparable to evaluation at the discursive level of consciousness. It proceeds spontaneously and automatically, with 'lightning speed' so to speak. It would be more appropriate to speak of Self-evaluation, where 'Self' is the field of transcendental consciousness (see chapters 8 and 9 for more clarification).

5. Note that I do not deny or leave out the social norm-related component. To my mind, however, there is no fundamental difference between the motivational and social norm-related components of the Fishbein-Ajzen model. For that reason I combine them in my model in one route (the upper route in Diagram 5).

passive view of human behavior". Human action is conceptualized as "a rather passive (if not externally determined), mechanical, rational, and individual process" (ibid.:65). Leeuwis rather speaks of the *socially constructed* nature of beliefs, (social) norms and attitudes.

> "As soon as one starts to look at actors as having agency (that is, the capacity to make a difference), Van Woerkum's and Röling's distinction between voluntary and non-voluntary behavior becomes rather vague and gradual. Both power and constraints play a role in all human (inter)action, but are at the same time enabling, and leave a certain space for manoeuvre" (ibid.:64).

I tend to agree with Leeuwis that the distinction between voluntary and non-voluntary behavior is vague and gradual. For example, the majority of a group of local researchers in East Africa might implement irrelevant research, mainly due to very low salaries, and a lack of intervention power and countervailing power. At the same time, however, one will always encounter some individuals who do an excellent job. While the low salaries (justifiably) result in low motivation and inadequate performance with many researchers, and the lack of intervention power with the top management and of countervailing power with farmers result in poor client orientation (the upper route in Diagram 5), some individuals apparently are internally motivated to perform well in spite of the lousy external conditions (they also follow the lower route). The observation that there is always a certain space for manoeuvre -at least with some people- corresponds not only with my experience, but also with historical events[6].

I want to emphasize here that in Diagram 5 the upper and lower route together determine behavior. I distinguish between the two routes for analytical purposes, but in actual practice they cannot be separated. People are not continually conscious of learning processes and behavioral changes, they are not aware to which degree a certain behavior is the outcome of the upper and lower routes. Often we just do things. Still it might be useful for analytical purposes to develop a model such as Diagram 5.

The conventional attitude-behavior model emphasizes action as a matter of constant and conscious choices (Spaargaren 1997:28). Behavior is seen as the result of a conscious, rational process of decision making or selection. The attitude-behavior model focuses on 'discursive consciousness', which is the part of consciousness that deals with knowledge which can be verbalized. However, in the reflexive monitoring of behavior actors also use knowledge that cannot be (instantly) verbalized. This knowledge of a 'practical' nature is part of the 'practical consciousness' (ibid.:148) (Diagram 7). People's behavior has often a matter-of-course character, people follow everyday routines and are often unaware of the choices they make. Habit, routine or tradition often steer people's behavior 'unconsciously' (ibid.:130). The concept 'practical consciousness' entails that we can steer our behavior "in a skilful manner without being aware of it on a discursive level. We just do it on automatic pilot" (ibid.:28). This practical consciousness plays an important role in the routinization of everyday life (ibid.:132)[7]. The boundaries between discursive

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6. Human history shows that even in the most dreadful conditions some individuals managed to preserve their agency and integrity. One example is Hermann Hesse, who refused to bow to the madness of Nazism. When enough individuals (actors) maintain or regain their agency, dramatic changes in societal structures can be the result. A recent example is the fall of the Berlin Wall and the changes in Eastern Europe.

7. An example of 'practical consciousness' (a concept of Giddens) is the speaking of a language with the perfectly natural mastership of grammatical rules. "People 'know' how to speak a language, but are often unable to verbalize the grammatical rules, the knowledge involved, at a discursive level. It is not uncommon for a person who has mastered a foreign language to (temporarily) know more about this language at the discursive level than a native speaker" (Spaargaren 1997:148). I can confirm this from personal experience: sometimes I cannot explain

and practical consciousness are fluid, and the dichotomy of 'conscious selection' and 'routine action' is meaningless (ibid.:148). This is in line with the model of Bos which is characterized by a kind of 'automatic rhythm' between words and deeds (section 1.2). It is also in line with Gremmen's (1993) discussion of the relation between knowledge and action - between thinking and doing (we will come back to Gremmen's 'interplay model' in section 12.3). Spaargaren (1997:151) remarks that actors only will begin to verbalize reasons for their actions when they are questioned, either by themselves or by others, about the reasons for their behavior. The ensuing retrospective verbalization can be a rationalization, an accommodation of beliefs to attitudes which one does not want to change (Allport 1958). In Diagram 5 the discursive and practical consciousness are indicated in the box which represents the actors/agents. Now we will turn to a discussion of the actor-structure debate.

3.3 The actor-structure debate

The socio-psychological attitude-behavior models neglect the influence of structure on action: they do not provide a satisfactory description of the relationship between behavior/action and structure. The link between processes at the micro- and macro-level is not clear (Spaargaren 1997:126). In order to bridge the gap, the actor-structure issue itself must be placed at the centre of analysis (ibid.:133). This can also abolish the unhappy 'division of labor' between social psychologists -concerned with the micro-level- and sociologists and philosophers - concerned with the macro-level (ibid.). Also Leeuwis (1993:101; following Munters et al. 1985) is of the opinion that one can overcome the actor-structure dualism by "not try to solve the dualism by choosing position in it, but ..tend to problematize the dualism itself". Leeuwis refers to Giddens (1984) who in his 'theory of structuration' tries to bridge the long-standing controversy between structuralist and interpretative approaches in sociology. Giddens characterizes structuralist approaches as being "strong on institutions, weak on action" with a deterministic flavor, while interpretative approaches are "strong on action, weak on institutions" with a somewhat voluntaristic flavor (Giddens 1985: in Leeuwis 1993:101). In structuralist approaches actors are conceptualized as rather passive individuals who react to external forces that operate 'behind their back', while in interpretative approaches human conduct is interpreted within a more active conceptualization of human behavior, but issues of power and institutional transformation are neglected (Leeuwis 1993:101). Also Spaargaren (1997:28) concludes that the structuration theory of Giddens offers the best perspectives for solving the problems associated with the attitude-behavior approach ('at least at the conceptual level', he adds). In his view, Giddens' theory seeks to bridge the gap between action and structure.

In Giddens' theory of structuration the concept 'duality of structure' plays an important role.

> "Within the reproduction of social practices, human beings as knowledgeable and capable agents make use of sets of rules and resources which are constituent for their behaviors. By drawing upon these rules and resources, they are at the same time reproducing these rules and resources. These rules and resources are to be conceived of as structures having a virtual existence: they are only real or visible during the moments of their instantiation, within the process of structuration" (Spaargaren 1997:28).

Dutch grammar to my Tanzanian wife.

The 'dual character' of structures refers to the fact that actors are 'forced' to make use of existing structures -structures are 'media' which enable actors to act- and at the same time structures are 'outcomes' of human actions because these actions confirm and reinforce these structures. Structures are therefore both media and outcomes of human action (ibid.:145). In structuration theory one avoids the micro-macro terminology because of the many connotations attached to these terms: micro-processes being associated with 'subjectivity' and 'freedom of action', and macro-processes with 'objectivity' and 'structures which restrain the freedom of action'. In structuration theory one speaks of 'analysis of strategic conduct' and 'institutional analysis' respectively. Social practices are approached from the 'left' and the 'right' in Diagram 7, or via the lower and the upper route in Diagram 5 successively. In that way one gets hold of the idea of interplay between action and structure (ibid.:192). In an analysis of strategic behavior the 'structures' are 'bracketed out' for a while, are assumed to be 'given', and vice versa (ibid.:145). The distinction between individual behavior and institutional behavior is untenable in structuration theory (ibid.:146).

The 'theoretical' solution of the actor-structure dilemma by Giddens is often criticized for not taking serious existing structural constraints: empirical facts show that actors have very little room for manoeuvre. Giddens, however, argues that a distinction should be made between formal, conceptual exercises and historical empirical matters. He maintains that structures are always both enabling and constraining, and the actual room for manoeuvre at a specific point in space-time must be decided upon by historical empirical research (Spaargaren 1997:29). In my view the solution of the actor-structure dilemma 'at the conceptual level' through introduction of the concept 'duality of structure', and through temporarily 'bracketing out' the structures or the actors, remains unsatisfactory. The emphasis is said to be on the *interaction* or *interplay* between actors and structures, but *how* this interaction comes about remains unclear. If one 'brackets-out' either the structures or the actors for a while, assumes them to be 'given', then the interaction surely cannot be studied, at least not in a genuine 'real world' mode. In Diagram 5 I have placed the concept 'collective consciousness' at the interface between actors and structures (see also Diagram 8 for a simplified version of Diagram 5. Diagram 8 is based on Spaargaren's model depicted in Diagram 7, but with the concept collective consciousness included). The concept collective consciousness is an essential component of the -still to be introduced- transcendentalist paradigm. In chapter 9 we will discuss this concept extensively, here I just summarize that discussion. Social scientists such as Sorokin and Durkheim say that society is something outside, and something inside us. Society has an objective aspect (a concrete social structure) and a subjective aspect (a collective consciousness). The collective consciousness and the socio-cultural structure are the inner and outer side of the same socio-cultural reality. The central ideas and values, that are internalized in the collective consciousness, form the basis of all sub-structures in a society. The technological, economic, political, social, cultural, educational, and religious sub-structures of a society are connected through this collective consciousness (In Diagram 5 the box representing 'structures' can be any one of these sub-structures). All individuals who form these sub-structures are connected through this 'field' of collective consciousness. Ransijn (1985) refers to the collective consciousness as the integrating, inner structure of a society. With regard to the actor-structure debate, and the *interface* and *interaction* between actor and structure, I will argue in chapter 9 that the concept collective consciousness could be the missing link in this long-standing debate. This concept can integrate the socio-psychological and structural approaches.

Another author who stresses that the *interaction* between structures and actors (attitudes) is fundamental, is the eco-philosopher Zweers (1995a:18). In his view the question whether the primacy lays with structures or actors is a chicken-and-egg problem. Nevertheless, he emphasizes that changes at the level of *basic attitudes*, at the level of fundamental norms and values, are necessary. But norms and values do not operate in a social vacuum: they need societal institutions in order to be effective at a large scale (ibid.). Zweers maintains that institutional changes are impossible without changes in individual actors: institutional changes must be inspired and supported by changes in basic attitudes, they require public support or a social basis. In his view a system of positive and negative sanctions is not sufficient to change people: a conviction is necessary, a conviction that is embodied in a basic attitude. Convictions can be *aposteriori* or *apriori* (ibid.:20). *Aposteriori* refers to a conviction that is enforced by the developments, it is a willingness or readiness to act when one sees that things go wrong, when the negative sanctions become too large (for example, when human action results in such severe pollution of the environment that human existence is endangered). An *apriori*-willingness, on the other hand, is not enforced by external developments but is based on a genuine, internalized conviction, on a basic attitude, on fundamental norms and values (ibid.). An *aposteriori*-willingness to act refers to the upper route in Diagram 5 (it is based on an evaluation vis-à-vis external developments), while an *apriori*-willingness refers to the lower route. In this context the distinction between reactive and pro-active change is relevant (see also section 6.2). I want to remark here that I distinguish between externally imposed norms and values (e.g., morality based on the authority of a church) and internally 'imposed' norms and values, that are grounded in a personal, experiential spirituality (see section 8.2). Furthermore, I believe that adequate attention for both these forms of morality is the safest way to a sustainable future.

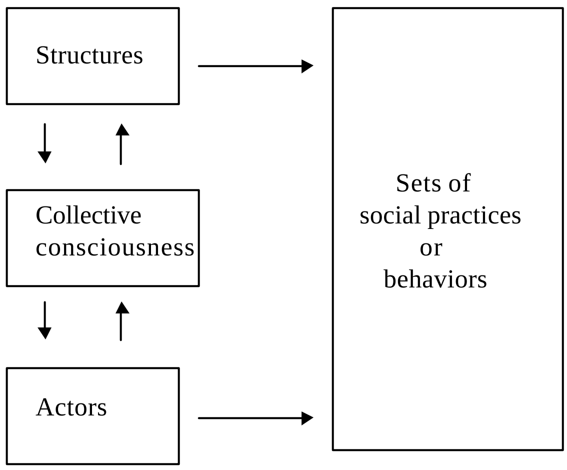

Diagram 8: Simplified conceptual framework relating actors, structures, collective consciousness, and behaviors.

In his discussion of an ecological modernization of modern industrial society, Spaargaren (1997:137) draws on Elias' concept (1982) of a long-term civilization process. This process takes place in societies wherever and whenever the chains of interdependence between people are becoming longer and more branched. People increasingly have to 'attune' their behavior to that of others (Spaargaren 1997:137). (As we will see later on, this attunement of behavior can easily be understood with the concept collective consciousness). Spaargaren (1997:138) uses the concept 'environmental civilization' and remarks that rules of good environmental behavior -agreed upon and defined in a social process- have to become 'second nature'.

> "...the rules of good environmental behavior currently being developed should be introjected in the decades to come. Social environmental coercion will have to be transposed into environmental self-coercion, in such a way that environmentally friendly behavior becomes a matter of course. Once this process has been completed, we will have acquired an automatic pilot steering our environmental behavior in the right direction" (ibid.).

> "What we are talking about is, in terms of the structuration theory, a process of reflexive monitoring of behavior by knowledgeable and capable actors, who routinely -at the level of practical consciousness, the level of the automatic pilot- 'stay in touch' with certain rules of the game, i.e., with a set of criteria for ecologically rational behavior" (ibid.:151).

I want to draw attention to the concepts 'second nature', 'environmental self-coercion', 'automatic pilot', and 'practical consciousness' which all seem to refer to a process of internalization. The structuration theory of Giddens is a formal theory, which lacks a normative 'Leitbild' for behavioral change in the direction of a more sustainable society (ibid.:142). What more sustainable lifestyles are needs to be defined in a social process, and subsequently a set of criteria for ecologically rational behavior must be 'internalized'. To my mind this 'internalization' process is linked to the upper route in Diagram 5. Extension can provide information on 'rules of good environmental behavior', but extension focuses on the discursive consciousness only. Evaluation of externally provided data and information takes place at the level of this discursive consciousness, possibly resulting in changes in beliefs about consequences of certain behaviors. It is a process of conscious selection in which information is not (yet) deeply internalized (represented by arrow number 1 in Diagram 5). The information, however, should not only appeal to the discursive consciousness, but must also become part of the practical consciousness, of the automatic pilot. Arrow number 2 in Diagram 5 represents this process, in which evaluation takes place at the level of the practical consciousness. It is a less conscious, more automatic, routine-based process in which information is more deeply internalized. It might be that information which has been several times evaluated at the level of the discursive consciousness moves to the level of the practical consciousness, and then follows arrow number 2. Although internalization is a 'black box' process, attempts to accelerate (and/or partially circumvent) this process deserve our attention (I will come back to this issue in section 11.4). It is important to remark here that Diagram 5 is an attempt to an ideal-typical model for analytical purposes only - a model, however, that might enhance our understanding and result in new approaches to behavioral change. With regard to the feedback loop in Diagram 5 (arrow number 4) one can argue that through performing a certain behavior, the beliefs about the consequences of that behavior might change, and result in new attitudes toward that behavior. Although performing a certain behavior for a long period of time might result in such changes in attitudes in the upper route, I do believe this to be a very unlikely route (the initial motivation to perform the behavior originates from where?).

Extension needs support from other activities which focus on the upper route (for example, price policies that support environmentally friendly behavior), *and* support via the lower route, the route to which I will turn now. In Diagram 5 a level of transcendental consciousness underlies the discursive and practical consciousness of actors. In Spaargaren's (1997:144) 'action model' (Diagram 7) the discursive and practical consciousness are underpinned by an 'unconscious' (which is not further specified). The difference between this 'unconscious' and the 'transcendental consciousness' is, in my view, essential. The state, or quality, of being 'unconscious' refers to unawareness, to ‘not being aware of’. In order to clarify the concept transcendental consciousness, we have to make a distinction between *consciousness-as-such* (pure or transcendental consciousness) and the *contents* of consciousness: i.e., thoughts, ideas, opinions, ideologies, impressions, perceptions, emotions, and so on (Ransijn 1985). The public opinion, and political and environmental awareness, for example, refer to *contents* of consciousness. We can get access to the field of transcendental consciousness, we can directly *experience* it, we can become aware of it, through, for example, meditation techniques. A first hypothesis is that people can get regular access to the field of transcendental consciousness, which makes that this transcendental consciousness is ‘enlivened’ in the discursive and practical consciousness. A second hypothesis is that with regular access to the field of transcendental consciousness environmentally and societally friendly (‘life-supporting’) information will be easier and quicker internalized (the processes represented by the arrows 1 and 2 in Diagram 5 are facilitated). Arrow number 3, which points from the borderline of practical and transcendental consciousness to the box with internal norms and values (basic attitudes), indicates that self-evaluation is enacted at the interface of these two levels of consciousness. A third hypothesis is that at this interface ‘life-supporting’ basic attitudes spontaneously emerge - that is without intervention of the discursive consciousness. Such basic attitudes *guide* behavior in an environmentally and societally friendly direction, in conjunction with the evaluation vis-à-vis external agents and/or ideas. As indicated earlier, both routes always apply simultaneously: the upper and lower routes together generate a certain behavior (see Diagram 5). Regular access to transcendental consciousness results in ‘life-supporting’ basic attitudes, but these basic attitudes do not automatically result in effective action in the domain of existence: relevant knowledge and practical skills -which are learned and constructed- are also necessary (the arrows 1 and 2). One can say that these basic attitudes guide the application of knowledge and skills in an environmentally and societally friendly direction. Above hypotheses will be discussed in more detail in the chapters 8, 9 and 11. Here I just want to remark that scientific research on the Transcendental Meditation technique indicates that societally friendly behavior of large groups of people can be facilitated by techniques for consciousness development. What environmentally and societally friendly behaviors exactly are, is defined in a social process: these practices are always socially constructed. Nevertheless, I also believe that there are some kind of ‘universal’ basic attitudes which can be ‘enlivened’ or ‘activated’ by access to transcendental consciousness, and which can then guide our behavior in a sustainable direction (the teachings of the major religions refer to these universal basic attitudes, but, unfortunately, have not always been effective in ‘activating’ them). Summarizing, I want to recall that Diagram 5 differs in two ways from the original Fishbein-Ajzen model and Spaargaren’s ‘action model’: my model includes an internal norm-related component of attitude, and it includes the concepts transcendental and collective consciousness.

3.4 An actor-oriented sociology of development

The actor-structure debate plays also a role in the actor-oriented approach within the sociology of rural development. The usefulness of an actor-oriented sociology of development has been shown in empirical research, namely in ‘the deconstruction of planned intervention’ and in ‘farming styles research’ (Leeuwis 1993:78). With regard to planned intervention, Long & Van der Ploeg (1989: in:Leeuwis 1993:79) remark that the concept of intervention needs *deconstruction* since it is not simply “the execution of an already-specified plan of action with expected outcomes”, but rather an “on-going, socially-constructed and negotiated process”. Development projects are arenas of struggle between different groups with different interests (Leeuwis 1993:79). Also in ‘farming styles research’ the actor-oriented approach proved useful. It tries to explain the differential responses of actors to similar structural circumstances (Long 1990). The ‘styles of farming’ studies (e.g., Van der Ploeg 1991) focus on heterogeneity in farming, and show that a considerable diversity in patterns of farming exists among farmers operating in comparable ‘structural’ conditions (Leeuwis 1993:80). Apparently farmers can structure -at least to a certain extent- their own environment. The various patterns of farming can be seen as *“strategic positions* vis-à-vis economic, technological and political developments..” (ibid.). In my judgement Long’s actor-oriented perspective and Van der Ploeg’s ‘farming styles research’ point -if not to the primacy of the individual over social structures and other macro forces- at least to a certain space for manoeuvre for individual actors. Structures ‘produced’ by other actors can be enabling and constraining.

> “External factors are not relevant as ‘ultimate causes’. Their relevance is to be located in the degree in which they figure as self-evident and internalized limits beyond which no action can be conceived or as imposed boundaries that are taken up as possible themes for negotiation, reconsideration, sabotage, and/or change, i.e., as “barriers that have to be moved” (Bourdieu 1984:480)” (Van der Ploeg 1990: in Leeuwis 1993:81).

Leeuwis (1993:76) looks for a non-deterministic conceptualization of the relation between human action and structure, and says:

> “..‘external’ structures can have consequences only when they are in some way or another ‘internalized’ as ‘self-evident boundaries/limits’. ... ..‘external’ structures (as perceived by actors, and to the extent that they are experienced as constraining and/or enabling) have a certain explanatory power. ... Of course...I am not talking about ‘ultimate causes’...but indeed about causalites that are actively moulded by actors, within a certain space for manoeuvre” (ibid.:82).

Immediately the question crops up why different actors create different spaces for manoeuvre; why does one actor evaluate, interpret or internalize an ‘external’ factor as a constraint, while another actor evaluates the same ‘external’ factor as an opportunity, as room to manoeuvre. The evaluation of external factors takes place in the upper route of Diagram 5, and the two arrows from the discursive and practical consciousness to the upper route indicate that this evaluation is enacted at these two levels of consciousness (the arrows number 1 and 2 successively). When the evaluation of the possible consequences of a certain behavior X (e.g., ecological farming) is positive, a positive attitude toward that behavior is the result. The evaluation, however, can also entail that no real alternatives to current behavior are available, or that it is too difficult to change one’s habits. In that case a negative attitude toward behavior X is the result. An example of actors, who created space for manoeuvre vis-à-vis a ‘hostile’ external environment, are the few bio-dynamic and ecological farmers in The Netherlands who started their enterprises many years back. These pioneers of sustainable farming certainly had to row up stream. The technological, economic, political and social sub-structures of society were not ‘enabling’. They voluntarily decided to become a kind of ‘social outcasts’, even for many of their (conventional) colleague-farmers. Why would you do this? Probably the answer lays with internal norms and values, with basic attitudes.

In their actor-oriented sociology of development Long & Van der Ploeg characterize the concept ‘structure’ as:

> “an extremely fluid set of emergent properties, which on the one hand, results from the interlocking, and/or distantiation of various actors’ projects, whilst, on the other hand, it functions as an important point of reference for the further elaboration, negotiation and confrontation of actors’ projects. Understanding structure in this way, as the products of the ongoing interlocking, interplay, distantiation and mutual transformation of different actor’s projects, is not to say that structure should be conceptualized simply as the aggregation of micro-episodes, situations or projects” (Long & Van der Ploeg 1991: in Leeuwis 1993:81).

This characterization of the concept ‘structure’ refers to Giddens’ concept ‘duality of structure’. The ‘dual character’ of structures denotes that structures are both media and outcomes of human action (section 3.3). Above definition also conveys a notion of *dynamic balance*: the *interlocking* and *distantiation* of actors’ projects can be understood as a dynamic balance between integrative and self-assertive tendencies. These two opposing, but complementary tendencies play a role in Koestler’s theory of holism (we will come back to Koestler’s theory in chapter 7). In the dynamic interplay between these two tendencies *mutual transformation* of actors’ projects takes place. In my view Koestler’s concept ‘holon’ could be useful to enlarge our understanding of the interaction between actors and structures. Leeuwis (1993:83) argues that Long & Van der Ploeg provide little insight into the precise relationship between actor and structure.

> “...it is necessary to conceptualize exactly how micro-episodes, situations, projects or different sets of interlocked projects, are or are not connected (ibid.). ... What is needed...is a fundamental (meta-)theory of what exactly social structures are, how they influence social (inter)action and vice versa” (ibid.:39).

Long & Van der Ploeg characterize ‘structure’ in their definition as an ‘*extremely fluid set of emergent properties’*. In their actor-oriented perspective structures are essentially seen as existing in the minds of people (‘external’ structures are seen as constraining and/or enabling, depending on how they are ‘internalized’). I will argue in chapter 9 that the transcendentalist paradigm with its concept of ‘the field of collective consciousness’ could be a fundamental meta-theory, which might contribute to a better understanding of *how* the interaction of different sets of interlocked projects takes place. I will argue that the field of collective consciousness could be the ‘glue’ that connects actors’ projects. The *field of collective consciousness* could be characterized as an *‘extremely fluid set of emergent properties’.* It could be the missing link in the actor-structure debate (see Diagram 8 in section 3.3).

3.5 Conclusion

In this chapter more learning about F (framework of underlying concepts: Diagram 2) took place. Based on literature in the fields of social psychology and the sociology of rural development Diagram 5 was constructed. This diagram is a conceptual framework which combines the attitude-behavior model of Fishbein-Ajzen (Diagram 6) with the actor-structure debate (Diagram 7). Summarizing, I conclude that a certain behavior is the result of beliefs about the consequences of that behavior *and* the result of internal norms and values. The attitude toward a certain behavior can be based on evaluation vis-à-vis external ‘agents’ *and* self-evaluation. A certain behavior is the result of compliance and identification with external agents *and* the result of ‘obeying’ basic attitudes. Compliance and identification can be ‘enforced’ by many sub-structures (technological, economic, political, social, cultural, educational, and religious). These sub-structures try to influence the beliefs about the consequences of a certain behavior at the level of the discursive and practical consciousness. The role of the practical consciousness indicates that this process is not constantly and fully conscious. Basic attitudes emerge at the interface of transcendental and practical consciousness. Diagram 5 is an attempt to an ideal-typical model for analytical purposes only. The upper and lower routes can perhaps be distinguished, but certainly cannot be separated: they apply simultaneously. In real life situations people most of the time just do things.

Diagram 5 provides an analytical perspective for the interpretation of my work experiences and FSR literature, and elucidates the selection of four main issues. Especially the selection of the main issues ‘attitudinal factors’ and ‘lack of countervailing power’ becomes more transparent. Although these two issues are (recently) regularly mentioned in FSR literature (chapters 2 and 5), measures to be taken to overcome these bottlenecks are largely missing. Diagram 5 might suggest ways to handle these issues. The problematic nature of the other two main issues -holism and interdisciplinarity- is inherent to FSR theory and, thus, practice (section 2.4). As we will see in later chapters, the diagram will also prove useful in the clarification of these issues. The selection of the four main issues -after the presentation of my work experiences and the FSR literature- can thus be grounded in a conceptual framework. A framework or analytical perspective, moreover, which takes into account earlier work at Wageningen Agricultural University (Röling, Leeuwis, Long, Van der Ploeg, Spaargaren).

4 OVERVIEW OF WORK EXPERIENCES IN EAST AFRICA

Introduction

I had the opportunity to participate in FSR activities in four East African countries (Mozambique, Kenya, Tanzania and Zambia)[1]. In Table 3 some basic data are given; more detailed information will be given in the respective sections. See Map 1 for the location of the four working areas.

Table 3: Basic data of four work experiences (OSR = on-station research, OFR = on-farm research).

Period	Country	Institute/Project	Main activity	Type of farming
Dec.'78-Jan.'82	Mozambique	National Institute of Agronomic Research (INIA)	OSR, collecting germplasm of local foodcrops	rain-fed farming
Nov.'82-Jun.'85	Kenya	Lower Tana Village Irrigation Program (LTVIP)	OFR	small-scale irrigation schemes, rain- and flood-fed farming
Feb.'89-Mar.'91	Tanzania	Uyole Agricultural Centre (UAC)	adaptive research adviser	high-altitude, rain-fed farming
Jan.'94-Jan.'96	Zambia	Farming Systems Research Team-Western Province (FSRT-WP)	OFR and OSR	rain- and flood-fed farming

In this chapter my work experiences in East Africa will be discussed. Objectives of this chapter are: 1) to provide a general picture of the background against which FSR in East Africa is implemented (description of A: the area of application. See Diagram 2 in chapter 1); 2) to find out whether FSR faces operational problems; and 3) to ground the main operational problems and the ensuing research question in my work experiences. The interpretation of my work experiences is based on the analytical perspective as presented in chapter 3. In this chapter the first learning about A and M starts: we learn about the actors in the field of rural development in East Africa, and about the FSR methodology.

4.1 National Institute of Agronomic Research (INIA), Mozambique. The introduction of a client-oriented attitude and farming systems perspective

4.1.1 *Introduction*

From 1979 to 1982 I worked as an FAO associate expert in a crop production and protection project at the National Institute of Agronomic Research (INIA) in Mozambique. The first

1. In addition to the long-term assignments in 4 East African countries, I participated in 8 short-term assignments (formulation and evaluation missions) of which 7 were in Sub Sahara African countries. All these missions were in the field of agricultural research, extension and education, and helped to shape my view on the process of rural development, although to a lesser degree than the long-term assignments.

two years I was based at one of the INIA agricultural research stations in Northern Mozambique (in Nampula province, at the ‘Posto Agronomico de Namapa’). My main task was to implement on-station experiments, which had been designed by FAO experts at INIA headquarters in Maputo, the capital city. After two years, during which I learned the bolts and nuts of on-station field experimentation, I moved to the provincial capital and the emphasis shifted -on my own initiative and request- to collecting and testing of germplasm material of the local food crops sorghum, cassava and various food-legumes. These major food crops of the Northern provinces had till then been largely neglected in INIA’s research program.

Map 1: Four working areas in East Africa
1. Nampula Province, Mozambique.
2. Lower Tana area, Coast Province, Kenya.
3. Uyole, Mbeya Region, Southern Highlands, Tanzania.
4. Mongu, Western Province, Zambia

In addition to the long-term assignment from 1979 to 1982, I participated in three short-term assignments in Mozambique (1988, 1991, 1992). The last short-term assignment was a consultancy to INIA[2] with the objective to formulate new procedures and methodologies for an

2. This consultancy was financed by the Swedish International Development Authority (SIDA) and implemented by Helsinki University Knowledge Services (HUKS).

improvement of the functioning of agricultural research. This section 4.1 is based on the report of this mission (Van Eijnatten et al. 1992), unless otherwise indicated.

Small scale farmers -the ‘family sector’ in Mozambican terminology- are responsible for the major part of the food crop production (maize, sorghum, cassava and pulses) and for the production of cashew nuts. In 1991 the family sector produced more than 90 per cent of the basic foodstuffs. These farmers also provide an important contribution in the industrial products cotton and copra. A small commercial sector (the private sector) plays a relatively large role in producing export crops, but its role is still minor when compared to the contribution by the family sector. Of the total land area in Mozambique around 80 per cent is not exploited, 19 per cent is used by the family sector (around 4 per cent cultivated land and 15 per cent fallow land, pasture and trees), and the private, state and cooperative sectors occupy each less than 1 per cent. Some 2 to 2.5 million farming families cultivate 95 per cent of the country’s arable land in farms measuring, on the average, 1 to 1.5 ha. Only two per cent of the arable land is irrigated.

Since 1983 (the fourth FRELIMO party congress) the importance of the small farmer became better recognised. This came about when the failure of state enterprises and the lack of progress in the farming cooperatives and communal villages had become apparent. Although some 1.8 million people (about 12 per cent of the total population) are living in 1,350 communal villages, farming is carried on in the traditional way. Small scale farming is characterized by the use of manual labor with hand tools and some animal traction, and by a low level of inputs.

With regard to the various agricultural sub-sectors in Mozambique a serious misunderstanding in respect of the real nature of the family sector should be clarified. The agricultural sector in Mozambique is characterized by a structural dualism (Carrilho et al. 1990)[3]. Although government policy nowadays is focused on smallholders, a distinction is made between the peasant sector (‘o sector familiar’) and the private sector (‘o sector privado’). Carrilho et al. (1990) say:

> “The concept of the ‘family sector’ in use is not helpful in formulating a policy directed at the mass of small peasant producers who constitute the backbone of the rural economy. The development of relatively small, market-oriented producers is not the direct equivalent of the development of the peasant sector in Mozambique, it focuses rather on the so-called private sector. The use of the term ‘family sector’ has blurred this distinction”.

The peasant sector was -and still is- considered as a subsistence sector with limited relationship to the market. Although the production of cashew and cotton has fallen dramatically since 1975 (the year of independence), the peasant sector still is producing the bulk of these export crops.

One would expect agricultural research in Mozambique to focus on the large majority of farmers in the peasant sector, and not on the small private sector (Carrilho et al. 1990;Van Eijnatten et al. 1992). Ideally, the investments in research for these two sectors should reflect the importance of the sectors to the national economy. Unfortunately, the Economic Rehabilitation Program is not directed at development of the peasant sector. Although the objectives and priorities of this program have been explicitly intended to support the peasant sector, “in practice there has been an almost exclusive focus on developing the private sector” (Carrilho et al. 1990)[4]. Because of the large investments by donors in Mozambique, one can argue that the donor community is as responsible

3. According to Finan (1993) the agricultural sector in many other SSA countries is also characterized by a structural dualism.

4. A case in point is the cashew research and rehabilitation project, planned to start in January 1992 with financial support of the International Development Agency (Van Eijnatten et al. 1992:52-4).

for this situation as the government: the operations of donors are as much a part of the problems in Mozambique as of their solutions (ibid.). The government of the poverty-stricken Mozambique has little choice but to follow the policies as set by the donor community. Since the large group of resource-poor farmers -the peasants- do not have countervailing power, it is unlikely that in the near future their needs will be served by research and extension organizations. Despite verbal commitment to the peasant sector, local government and donors continue to focus on the relatively small group of so-called ‘progressive’ farmers, probably in the hope that this will result in quick increases in GNP and repayment of loans.

Box 1: Inappropriate agricultural training.

In 1991 I participated in an evaluation of two Mozambican agricultural institutes for the training of medium-level technicians. The main conclusion was that the training programs were not very relevant to the needs of the family sector. The school farms of the Boane and Umbeluzi Agricultural Institutes were highly mechanized, maize was grown under sprinkler irrigation with fertilizer and insecticide applications, and most animal stables were too sophisticated to be of much relevance to smallholder farming. This shows that in agricultural education the formal government commitment to family sector agriculture had not been translated into appropriate training programs (Van Eijk et al. 1992).

4.1.2 *Some realities at INIA*

INIA, established in 1965, had at independence in 1975 no national scientists. Before independence INIA had a staff of 43 professionals of whom 41 were based in Maputo. In 1992 around 20 Mozambican university-trained researchers worked in INIA, with only two possessing an MSc degree. Only a part of this professional staff was engaged in actual research; others were responsible for duties outside research. In fact, the structure of INIA was a complicated skeleton of a former research organization with a good deal more ‘boxes’ in its organogram than could be filled with meaningful activities and/or than could be staffed (SAREC 1991). In 1992 only six of the sixteen experimental stations of INIA were operational and accessible under the pertaining security conditions. Ninety per cent of the Mozambican agronomists had a posting in Maputo.

Research from INIA had hardly been adapted to the needs of family sector farmers (DASP 1988). The non-adoption of new technologies was caused more by the inappropriateness of technologies than by the mal-functioning of the extension service (China et al. 1990). From 1986 onwards an FAO project in INIA has been introducing the FSR approach - albeit with little effect. The farming systems approach should help INIA to formulate *more realistic and relevant research priorities* (DASP 1988). This laudable initiative, however, had been hampered by the lack of staff with field experience.

Field experiments are the heart and soul of agricultural research. For that reason the 1992 mission in which I participated, visited a number of INIA research stations and some sites where other organizations had been implementing field experiments. We visited more than 60 on-station and on-farm experiments[5]. The main observations on the implemented research work and the corresponding recommendations of the mission are presented in Box 2 (Van Eijnatten et al. 1992).

Box 2: Inappropriate agricultural research.

5. Detailed comments on the experiments visited by the 1992 mission can be found in the appendices of the mission’s report (Van Eijnatten et al. 1992).

- In quite a number of experiments the plant stand is so irregular and the differences in plant height such that trial continuation is not deemed useful. Erosion gullies in experimental areas can be prevented through (re-) establishment of contour bunds.
- The choosen experimental designs are not always the most appropriate ones. It is advisable to discuss experimental designs with an experienced biometrician at the *planning* stage of experiments. In analysis of variance tables significant treatment effects are not always partitioned in main and interaction effects.
- Blocks or replications are often narrow and stretched-out, thus unnecessarily increasing the within-block error due to soil fertility and other differences. There are often undesirable paths within blocks or replications. Blocks on sloping land are not always placed perpendicular to the gradient. The two top ends of the central lines in experimental plots are, as a rule, not excluded from the net experimental area. The experimental area is not always surrounded with guard rows or strips.
- In many intercropping experiments the choice of the treatments is not well defined. Why are these specific crop combinations and planting arrangements chosen? Are they expected to result in a higher productivity per unit of land and/or labor? Often the most common farmers' combination is not included. The net experimental areas in intercropping experiments are not always clearly defined.
- On-farm trials are sometimes planned before convincing on-station results are available. The number of treatments in on-farm trials is often too high and the choice of included treatments is not always well defined. Sometimes very high fertilizer levels are included and the farmers' level is missing. On-farm trials are sometimes too far dispersed, resulting in inefficient use of transport and manpower.
- At some research stations continuous experimentation on the same fields takes place, resulting in high coefficients of variation and unrealistically high yield levels, even in non-fertilized plots. A rotation of experimental fields with production plots would be more appropriate. Research results from Umbeluzi station, located close to Maputo, are only representative for a small area in Southern Mozambique (i.e., the area with atypical clay and valley bottom soils).
- The maize breeding program is implemented under high fertility conditions and, therefore, is unlikely to produce materials relevant to smallholders' conditions. Materials meant for smallholders are best selected and tested under low input conditions. The maize variety experiments at Umbeluzi and Chokwe research stations are implemented under irrigated, high fertility conditions with applications of herbicides and pesticides. There is a large gap in yield level between the average maize yield in Mozambique (0.5 ton/ha) and the yield levels in this kind of experiments. What is the use of trying to increase the experimental on-station yield level from, let us say, 4 to 5 tons/ha when the average farmers' yield is 0.5 ton/ha? The issue rather should be how to increase the average farmers' yield level from 0.5 to 1 ton/ha!
- In trial protocols no distinction between experimental and non-experimental factors is made. In a variety experiment, for example, the different varieties are the experimental factor. Non-experimental factors are fertilizer level, number and timing of weedings, pest/disease control, etc. In almost all the on-station experiments that we visited, the non-experimental factors are kept at a level far above average smallholders' conditions. The non-experimental factors in on-station research are best kept at smallholders' level, or at a level which the majority of the farmers can soon hope to achieve. The level of the non-experimental factors should always be defined in the protocols. Futhermore it is advisable to keep the range of the experimental factor treatments realistic in the sense that the majority of the farmers will be able to use the treatments tested in the nearby future.
- Many Mozambican and expatriate researchers do not comply with standard field experimentation techniques. High coefficients of variation at Namapa experimental station in the season 1978/79 were reduced to acceptable levels in the following season just through the application of these standard techniques (Van Eijk 1979; 1980; 1982). The coefficients of variation in the season 1979/80 were considerably lower simply through use of appropriate experimental designs, careful positioning of the blocks, use of border rows and border strips, careful sowing/resowing, and complete and clear protocols and field plans. It is possible to get more reliable results through proper application of standard field experimentation techniques "without investing more time and money" (Van Eijk 1980). Although sound recommendations on planning, field lay-out and analysis of experiments had also been given by others in INIA, e.g., Neto (1983;1989) and Van Leeuwen & Neto (1986), the quality of field experimentation in 1992 still was rather low.
- An economic evaluation of new technologies is only included in few research reports. It is of importance that discussions on research results include an economic analysis with real farm gate prices. Not only productivity per unit of land, but also productivity per unit of labor must be taken into account.

The quality and relevance of many of the research activities, as encountered during the field visits, was rather disappointing[6]. With respect to the relevance of the experimental activities, it can be argued that research based on high levels of external inputs can be relevant to the private sector, but it will not produce technology applicable under peasant conditions. Peasants simply do not have access to the external inputs and/or the costs of these inputs are prohibitive. It is important to emphasize this time and again. It is strongly suggested that current smallholders' farming systems are the starting point of attempts to increase agricultural productivity. This requires insight into smallholders' practices which can only be obtained through direct contact with the target group.

> "Experiments in local fields are focal points for a contribution from all three actors in the technology drama: farmer, researcher, and extension worker" (Collinson 1987b:170).

An important component of smallholders' farming systems, i.e., livestock enterprises, were not dealt with in INIA, not even the fodder and pasture component. It can be argued that the National Institute of *Agronomic* Research (INIA) should not be an agronomic, but an *agricultural* research institute. For the successful development of small-scale mixed farms the interactions between crops and livestock (such as manure, fodder crops, and animal traction) have to be studied. It follows that for agricultural researchers the internalization of a farming systems perspective, including crops, livestock and farm-household issues, is important.

It looks as if a large proportion of the Mozambican and expatriate agricultural research workers in INIA lacked *professionalism* and *commitment to smallholders*[7]. A lack of professionalism translates into *low quality* research work, and a lack of commitment to smallholders translates into *little relevant* research work. This may appear a 'hard' conclusion, but based on the mission's extensive review of literature on agricultural research in Mozambique, the interviews with many Mozambicans and expatriates, and -more importantly- the field visits, it seems an inescapable conclusion. The main 'causes' of this unfortunate situation are: 1) the lack of countervailing power with the peasant sector; 2) the centralized structure of INIA; and 3) the low salaries of researchers. These 'barriers that have to be moved' (Bourdieu: in section 3.4) result successively in largely irrelevant research, insufficient contact with the target group, and low motivation to perform at a high level of professionalism. With regard to the lack of countervailing power one can only hope that in the near future a more democratic organization of society will make it possible for the peasant sector to 'enforce' relevant and high quality research work. Regarding the second factor, the colonial inheritance of a centralized structure, it is obvious that in the early days after independence -characterized by a virtual absence of national scientists- the few trained professionals ended up in high-ranked, mainly administrative positions in Maputo. Although the concentration of researchers in Maputo is understandable from a historical perspective, the colonial days as well as the two decades after independence show that a centralized set-up is not conducive to the cause of the peasant sector. Whereas today's number of national scientists is still relatively low, it is important that these researchers build up field experience. As long as ninety per cent of the Mozambican 'engenheiros

6. An exception to the generally low quality of agricultural research was the excellent on-station research with rice at Chokwe research station, although its relevance to smallholders' conditions could be questioned.

7. Of course, there are always some scientists who perform far above the average level, but in general the performance was disappointing. An important problem was that the 'white-collar' mentality of at least a part of the senior INIA staff did not facilitate direct contact with farmers, and hampered the acquisition of first hand experience in agricultural research.

agr?nomos' reside in Maputo, the lack of field experience will continue to hamper the development of an effective research system.

Box 3: Quality of field experimentation

It is surprising, to say the least, that not in even one of the many reports studied by the 1992 mission any reference was made to the low quality of research in Mozambique. This leads one to suspect that previous formulation and evaluation missions had not visited many on-station and on-farm experiments, or at least had not studied them carefully enough. The quality of field experimentation is expressed in the value of the coefficient of variation: the coefficient of variation is an objective criterion which allows one to judge how careful field experimentation has been implemented. However, in order to be able to explain high values one has to see the experiments in the field. When the 1992 mission commented on the experimental design, implementation and analysis of field experiments, some INIA-based FAO experts strongly disagreed with the remarks of the mission, but failed to supply any research reports that refuted our field observations and line of argumentation. Thirteen years earlier, in 1979, the same thing happened to me when, as a young associate expert in Northern Mozambique, I implemented and analyzed experiments of Maputo-based experts[8]. All this indicates that a Maputo-based, centralized set-up of INIA did not -and probably will not- function.

In order to effectively provide solutions to the problems of the large group of peasants, it seems advisable to change the centralized structure of INIA. This implies a transfer of the majority of the activities and staff of INIA to a series of regional (from the agro-ecological point of view) research centers with their own finances and their own responsibilities. There are two main arguments for such a decentralization: 1) the impossibility to keep a completely centralized approach in operation given the long distances, paucity of connections and the expenditures involved; and 2) the above-mentioned need to build up experience at the level of field activities, both on-station and on-farm, thereby internalizing a farmer-oriented attitude and farming systems perspective. The FSR approach -introduced in INIA in 1986, but not yet really implemented- requires such a transformation of the centralized system of research. In the past two decades it has become clear that long distance control of experiments does not work. The centrally guided system with only occasional visits to the field by Maputo-based researchers, shown to be ineffective and wasteful of man-hours and funds, requires 'deconstruction'[9] (Hammersley 1978;Van Eijk 1982;Van Eijnatten et al. 1992). In recent years regionalization of agricultural research has been proposed in many African countries (Mutsaers 1994:62).

Adequate research management -dedicated to effective, relevant and high quality agricultural research for the family sector- has an important role to play in the transformation of the Mozambican

8. After submitting my analyses and comments to the Maputo-based experts and the FAO team leader, I got a letter from the team leader stating that as an associate expert I only had to implement the experiments. Comments on experimental designs and field experimentation techniques, and statistical analyses were not part of my job description. My job was strictly restricted to field supervision of the implementation of the Maputo-designed experiments. Fortunately, my Rome-based technical officer (a kind of back-stopper) supported my comments, which probably prevented a premature end of my career in FAO.

9. It is worthy of note that some researchers never saw their trials in the field and thus were not really in a position to judge fully their materials or assess why differences did not prove to be significant, or why failures occurred. Others visited their experiments two or three times, but, nevertheless, had too little insight into the circumstances when problems occurred. This situation in 1992 was still exactly the same as in the period 1979-1981 when I worked as an associate expert in Northern Mozambique (and when there was no security problem at all). In 1992 a frequently used argument against decentralization was the security situation in the countryside. Effective agricultural research is not possible under war conditions, but at the same time the centralized set-up of INIA, even under peace conditions, is unlikely to produce relevant and high quality research results.

agricultural research system. However, in 1992 the situation was such that insufficiently experienced researchers had been placed in responsible positions. These persons will not be able to comment thoroughly on work being proposed or work done, because they have hardly themselves been exposed to the practical problems of a research worker.

One of the most serious constraints to building capacity in the public sector is the lack of incentives for public sector employees. Staff salaries are low, too low for families to cover their normal needs (the third barrier that has to be moved). Without additional incentives it will continue to be difficult to transfer members of staff to other stations than headquarters. An increase in salary might be one way of approaching this.

Box 4: Topping up of local salaries by donor agencies and performance evaluation.

In pre-independence periods salaries were adapted in favor of those that had to perform their duties in stations far away from the headquarters at Maputo. In the northern provinces levels of salaries were at 200 per cent and in the centrally located provinces at some 150 per cent of salaries in the southern provinces. Topping up of local salaries by donor agencies is another possibility. This, however, should be linked to some form of performance evaluation. When topping up of salaries would be subject to a regular evaluation of performance, it could also be helpful in bringing about the required changes in attitude. When the 'topped up' member of staff does not perform adequately, the topping up of salary can be discontinued. Staff members should be informed in advance about criteria used in performance evaluation. Such criteria applicable to agricultural research workers could be: relevance of research work to small farmers, quality of field experimentation, and quality of reporting on research work performed.

Other possibilities to improve the conditions of work are: special opportunities for further study for those that are posted in the field; the provision of good and attractive housing, and transport facilities; and recognition of outstanding performance by research workers. The last issue implies a differentiation in the ranks of research workers, in such a way that gradations in ranks are indicative of the level of development achieved by the agricultural research worker and only attainable on the basis of merit.

Time after time, new plans have been put forward to initiate activities to uplift the farming community from its low level of productivity, but the sound recommendations of earlier missions, apparently, found a place in the archives (for example, the proposals for decentralization since 1978). It sounds like a good idea to make a start with the *implementation* of recommendations. Unfortunately, also the report of the 1992 mission was rejected by INIA, and shelved[10]. A shift

10. The mission's report met with the same fate as Carrilho's report (Carrilho et al. 1990). This sensible report by Mozambican and expatriate scientists was shelved as it was indigestible to the agricultural establishment. The two, free lance and therefore truly independent, expatriate members of the 1992 mission undertook to provide a frank and straightforward opinion, and provided thorough documentation to support the critical statements made. The situation of agricultural research and potential beneficiaries is such that indirect and more diplomatic approaches were not deemed useful. Moreover, earlier recommendations of other, possibly more diplomatic, missions had never been implemented. In 1993 an INIA working group prepared with the assistance of the International Service for National Agricultural Research (ISNAR) a medium-term strategy and plan for INIA (INIA 1993). The INIA/ISNAR plan supports the view of the established group of INIA workers, that the old structure should be filled in and enlarged. The overwhelming centrality of the Maputo group remains intact. This system has not worked in the past and no reasons are indicated in the new plan why it would work in the future. No doubts are raised at all in the INIA/ISNAR paper in respect of the quality and relevance of past and present research activities of INIA. In the opposite, research is considered of good quality and any failure in transfer of information is contributed to a lack of funds and inadequacy of research-extension linkages: the traditional Transfer-of-Technology (TOT) model prevails again. I do not know what the current state-of-affairs at INIA is. I

from a Transfer of Technology (TOT) approach with centralized institutions to a farmer-first approach (in Mozambique a *peasant sector-first* approach) implies a more decentralized arrangement driven by farmers' demands.

> "Such a system is arguably more cost-effective and resource efficient... But transforming organizations - and the individuals within them- is by no means an easy task. The TOT approach is firmly entrenched in institutional cultures, and in management and financial procedures, and is continuously reinforced by training in mainstream educational institutions" (Scoones & Thompson 1994).

4.1.3 *Conclusion*

If the Mozambican authorities effectively -not only verbally- want to support the overwhelming majority of farmers in the family sector, then the most feasible option in the short term seems to be to decentralize the agricultural research system[11]. The development of a relevant and high-quality research program requires that local and expatriate scientists have sufficient field experience. A farming systems perspective is difficult to acquire without frequent and regular contact with the target group. Field experience can facilitate the internalization of a farming systems perspective and a client-oriented attitude. Through regular contact with resource-poor farmers and participation in their farming systems, the feedback loop in Diagram 5 (chapter 3) might gradually result in a different attitude toward the peasant sector. However, the initial motivation to perform such a behavior remains problematic. Does the primacy lay with the behavior or the attitude? An attempt to 'solve' this chicken-and-egg problem could be the topping up of local salaries by donor agencies - linked to a performance evaluation. This could provide the initial motivation required to break the vicious circle. Nevertheless, it may be that *even* with higher salaries, a decentralized research structure, and more countervailing power with the peasant sector (all components of the upper route in Diagram 5), the performance of researchers still is not appropriate. In The Netherlands, for example, these three factors are well taken care of, but the performance of the agricultural research system in terms of the development of a sustainable agriculture has hitherto been inadequate. Nickel (1989) -an experienced research manager- says that the most important ingredient for commitment to excellence and high standards of performance is not money, but the *attitudes* of the employees[12]. This remark seems to refer to the lower route in Diagram 5. High quality and relevant research work might also be an expression of a basic attitude. More attention for this lower route seems desirable (we will return to this suggestion in later chapters). A combination of actions, focused on both routes, might well be the 'best bet' option. Such a two-pronged strategy also might create synergy.

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am afraid that only an extensive field visit to the research stations and farmers' fields would provide a reliable picture. Copies of the report of the 1992 mission are available at the library of Wageningen Agricultural University, the Royal Tropical Institute in Amsterdam, SIDA in Stockholm and HUKS in Helsinki.

11. I want to emphasize here that I am not in favor of restructuring research and extension organizations as a purpose on its own (as seems to be the case with many -frequently donor-driven- restructuring operations in East Africa). In the Mozambican situation the restructuring of INIA is a means to the end of building up solid field experience with agricultural researchers, hopefully resulting in relevant and high quality research work for the family sector.

12. Nickel (1989) remarks that commitment to excellence must not be restricted to how research is performed, but also how the hallways are cleaned, how neatly letters are typed, etc. One cannot expect high quality research to be performed in a place where other things are done in a slipshod manner.

4.2 Lower Tana Village Irrigation Program (LTVIP), Kenya. The introduction of small-scale irrigation schemes in a flood- and rain-fed farming system

4.2.1 *Introduction*

In the period 1983-1985 I worked in Kenya, in the Lower Tana Village Irrigation Program (LTVIP), a bilateral Kenyan-Dutch program for rehabilitation and development of small-scale, village-based irrigation schemes[13]. I was involved in on-farm research in these irrigation schemes and in rain- and flood-fed fields. The incorporation of irrigated plots in the existing farming system was a major issue here. This section 4.2 is based on two earlier project reports (Van Eijk 1986a;1986b), unless otherwise indicated.

The main ethnic groups in the project area are the Pokomo, the Orma and the Somali. The Pokomo -the target group of the LTVIP- are sedentary agriculturalists while the latter two groups are pastoralists. Following dramatic food shortages caused by drought conditions, four small-scale pump-fed irrigation schemes were established in the area in the late sixties/early seventies by some churches, FAO and USAID. In 1979/80 the activities of LTVIP started: the main objective was to rehabilitate existing schemes and to construct new ones.

The main characteristic of the area is the bi-annual flooding of the Tana river. When the water recedes from the inundated flood-plain farmers start planting crops; rice in the lower parts, and maize and green gram in the higher parts. This flood-recession (or flood-fed) cropping depends strongly on the occurrence and the height of the floods. The long rainy season floods fail on average in 2-3 years out of 10, and the short rainy season floods fail once in every 2 years[14]. In seasons without floods farmers can grow some rice at lake sides. Especially in the southern part of the project area farmers also cultivate rain-fed plots. The erratic rainfall (500-800 mm per year) and the irregular floods make agriculture a risky enterprise in the Lower Tana area, risky in the sense that sole dependence on agriculture can be tricky. Bananas, grown on the riverbanks, are the most important and most secure crop in the area; they constitute the never-failing staple in the diet of the Pokomo. The sale of bananas and mangoes contributes to the cash income of households.

A comparison of the number of Pokomo households, the agricultural land available and the actually cultivated area learns that there is no land shortage in the project area. Several food balance studies indicate that in years with normal floods (adequate depth and timing of floods) the energy requirement of Pokomo households is met (Hekstra 1979; Sprey 1983; Smit 1984). Pre-harvest shortages may occur, but these are covered by buying food in local shops. Pre-harvest shortages as well as shortages caused by failing floods could in principle be mitigated through more adequate storage facilities at farm- and district level. Protein shortages can be alleviated by the consumption of small quantities of fish.

Off-farm employment and the use of hired labor are important characteristics of the Pokomo farming system. Forty per cent of the households has somebody employed in a permanent off-farm job, and fifty per cent makes use of casual labourers. The labor requirements in the traditional flood-

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13. The Lower Tana area is located in the Coast Province with the LTVIP headquarters close to Garsen, about 100 km North of Malindi on the main road to Garissa and Lamu. See Map 1.

14. During my stay in the Lower Tana area there were no floods in two successive seasons (the short rainy season 1983/84 and the long rainy season 1984), which, according to some older farmers, was quite exceptional. Zoebl (1989a) reports two successive seasons without floods in 1987.

and rain-fed fields (excluding the fields in the irrigation schemes) can just be met, with most of the labor provided by women who work on average four hours per day in the fields. The climatic stress factors in the Lower Tana area, the sub-optimal health condition of women (Budelman & Eisses 1982), and their household duties make that an additional labor input from women cannot be expected. About one-third of the households is female-headed, mainly because the husbands are employed in permanent off-farm jobs outside the Lower Tana area. For a considerable number of Pokomo households agriculture is, thus, not the single or most important source of income and food. This makes it difficult to speak about the Pokomo as true farmers; many of them are part-time farmers to whom a concept as self-sufficiency in food through agricultural production does not apply. Those ones who have access to other sources of income, do not have to be self-supporting in food.

4.2.2 *Farmers' attitudes and the development of irrigation schemes in the Lower Tana area*

In this section various components of farmers' attitudes towards the development of irrigation schemes in the Lower Tana area will be discussed. The discussion focuses on:
i) farmers' attitudes towards flooding; ii) farmers' attitudes towards risks involved in irrigation schemes; and iii) farmers' attitudes towards the allocation of the production factors labor and capital.

i) Farmers' attitudes towards flooding.

The attitude of the Pokomo towards agriculture sometimes is described by expressions such as "no floods-no food", "waiting for the floods" and "Mungu akipenda" (God willing). The Pokomo are said to believe that one cannot alter one's destiny; the strong dependence on the flooding of the river would create an apathetic attitude. One has to be careful with such generalizations, because there are always exceptions to the rule. In every irrigation scheme in the Lower Tana area one could find some farmers who did an excellent job; some individuals continuously produced far above the average. Furthermore, it is a fact that the flooding pattern of the Tana river *is* quite unpredictable, and that individual Pokomo farmers do not have any control over the flooding regime, nor does the Pokomo community as a whole, being an ethnic group with relatively little political power. While they have little influence on the political decisions to construct barrages and artificial lakes upstream, these engineering works will strongly affect the Pokomo farming system through a changing flooding pattern. It is fair to say that, hitherto, people in the Tana delta fit in with the whims of the river, and not the other way round (Zoebl 1990). The so-called 'apathetic' attitude might be the only realistic option in a difficult environment (Huizer 1995). Röling (1988:65), writing about the diffusion of agricultural innovations, says that fatalism

> "could never be shown to persist and cause resistance to change when tangible opportunities presented themselves. At best, fatalism was shown to be an appropriate adaptation to a hopeless situation".

The use of the word 'fatalism' in literature on rural development is based on positivist thinking, characterized by the attempt to instrumentally manipulate causes, and aimed at instrumental control (see chapter 6). It might be more appropriate to refer to fatalism and apathetic attitudes in terms of the ecology-based concept 'adaptive management' (section 3.1).

ii) Farmers' attitudes towards risks involved in irrigation schemes.

With regard to the risk factor it is fair to say that the dependence on nature in the traditional farming system has been exchanged for a dependence on irrigation technology, which is neither under full control of the farmers. The unpredictable flooding pattern of the Tana river sometimes threatens the existence of the schemes. Brooks (breaks in the river bank) can damage the schemes despite the presence of flood protection dikes, or schemes can be cut off from the main river course. The closure of brooks was a time-consuming operation for LTVIP[15].

Another risk factor is the supply of inputs such as diesel and pump spare-parts, which are not always easy to obtain in the project area. In the period 1980-1987, when the Dutch government supported LTVIP, technical break-downs of pumps and engines could be solved without too much delay. Without donor support, however, the acquisition of spare-parts, which require foreign currency, poses a serious problem. Furthermore, the farmers have to pay a seasonal contribution to the scheme committee (communal charge) in order to cover the fixed and variable production costs, also when the yields are low. The operation and maintenance expenditures for water lifting by pumps constitute a major share of this charge. In order to cut down on fuel costs one tried to replace expensive pump-fed irrigation water as much as possible with free gravity water. Gravity-fed irrigation, supplemented by pumping, was in 1988 standard procedure in all the schemes. Gravity-fed irrigation, however, requires timely land preparation and planting, preferably by all farmers simultaneously. Nevertheless, the high fixed costs of (supplementary) irrigation by pumps (depreciation of pumps, engines and pipes is an important component) remain a risk to the farmer.

Involvement in an irrigation scheme implies that farmers lose their independence. Irrigation schemes cannot function efficiently without collaboration between farmers. Whereas the cultivation of a flood- or rain-fed plot is a strictly individual affair, farmers in a scheme are dependent on one another, and on decisions of the farmer-elected scheme committee. Irrigation development requires group discipline. Without this group discipline irrigation schemes cannot be managed and operated efficiently. When a farmer, for instance, does not maintain his part of the irrigation and drainage canals, the neighbours will also suffer.

> "In regions where irrigated cropping is not an integrated component of the indigenous farming system the required solidarity and discipline may not be expected to exist already. In those regions farmers must learn to share scheme responsibility and to observe the rules of group membership" (Kortenhorst 1983).

The loss of independence in irrigation schemes and the above mentioned risks made that whole-hearted commitment to the schemes was difficult to realize. As we will see later, this was exacerbated by the poor performance in terms of labor productivity. At the same time, neither the scheme committee and LTVIP nor the local government had real control over the scheme farmers. The most authoritative action that could be taken, in case of non-compliance with the rules set by the scheme committee, was eviction from the scheme. Eviction rarely occurred; it is a measure that is

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15. Zoebl (1990) reports that three of the five LTVIP schemes were threatened by the whimsical Tana river. One through an impending shift of the river course, and two because the arm of the river from which they take their irrigation water was running dry. Later on the Tana river close to Mnazini scheme indeed changed its course, so that this in 1982 constructed scheme could not be used anymore. Fortunately, the two other schemes Hewani and Wema are now situated within the flood protection dike of a new large polder, and are supplied with gravity water (Zoebl 1993; personal communication).

not easily implemented in a traditional African society. And even when a farmer is expelled, he/she still has 'exit' options such as flood- and rain-fed fields or off-farm employment. Farmers can always retreat into what Hyden (1980; 1983) calls "the economy of affection"; pre-modern, precapitalist social formations offer the security that one will survive. Hyden argues that coercion is required to remove the social autonomy of the peasants: modern development requires the curtailment of peasant power and freedom. Whether or not this argument is correct, the LTVIP experience shows that the introduction of modern irrigation technology into existing farming systems is attended by 'struggle' between farmers and change agents. On the one hand, irrigation development requires group discipline, while on the other hand the farmers' exit options make it difficult to 'enforce' this discipline. In this sense one can argue that scheme farmers had considerable countervailing power over change agents.

iii) Farmers' attitudes towards the allocation of the production factors labor and capital.

Although in LTVIP the relationship between the target group and the project staff was more correctly described in terms of a continual 'struggle' than in terms of smooth collaboration and participation, it cannot be denied that the farmers' decisions from *their* point of view and under *their* circumstances were rational. The allocation of the most limiting production factor, i.e., labor, was done according to the priorities of the farm-household. When labor invested in flood-fed rice growing, or in irrigation schemes for that matter, gives a lower rate of return than off-farm employment (as we will see later), then it is normal that such off-farm opportunities take priority. The differences in priorities resulted in continuous hard negotiations between intended beneficiaries and project staff. The farmers wanted LTVIP to be a kind of service institute that provided them with inputs such as fertilizer and diesel, tractor ploughing, and maintenance and repair facilities for the diesel pumps. LTVIP staff, on the other hand, wanted the farmers to become as independent as possible from outside assistance. This certainly was not going to be achieved through the supply of expensive, external inputs. Basically, the conflict of interests between farmers and project staff revolved around the fact that farmers considered the scheme plot as only one option in their arsenal of productive strategies, while LTVIP, at least initially, considered the irrigated rice plots as *the* solution to the farmers' problems.

Whereas LTVIP singly focused on irrigation schemes, farmers invested in flood- and rain-fed fields, scheme plots, off-farm employment, and education of their children. This risk-spreading strategy can easily be interpreted by outsiders as indifference to irrigation schemes, lack of motivation, or even laziness. However, it is more appropriate to define the attitude of the target group in terms of their priority setting. The decision of the farmers to divide their labor input over several enterprises did not improve the performance of the irrigation schemes. At the same time, however, poor and certainly not risk-free scheme performance enhanced involvement in other income-generating activities. This vicious circle proved difficult to break.

Since each household got a one-acre plot in the irrigation scheme and the schemes covered between 70 and150 acres, the LTVIP approach generally was labelled 'small-scale'. The construction phase of the schemes, however, was not small-scale at all; huge equipment such as a grader and scraper were used to build the dikes and to do the initial levelling. The labor input of farmers in this phase was rather marginal. One can wonder whether this was the right approach to induce a feeling with the farmers that the scheme was theirs. Given the availability of mechanical equipment, it was difficult to convince farmers, after the construction phase, to do their share in fine-levelling of the plots and maintenance of established structures. The approach followed in the construction phase certainly did not promote an attitude of self-reliance and self-help. On the other hand, it is also true that the target group would never have constructed the schemes by manual labor alone. Such an investment of labor was out of the question for the resident members of the households; if at all physically possible, the long-term input of strenuous work would not have been considered worthwhile, keeping in mind the alternative options open to them. A step-by-step approach in the construction of the schemes, with a larger labor input from the target group, was an unrealistic option from the farmers' point of view. They did not need the schemes that badly.

A difficult issue for LTVIP was that the Pokomo had a long experience with donor agencies providing technical assistance and food aid. LTVIP staff faced the problem to downgrade earlier raised expectations and to cope with a 'begging' attitude. A case of inappropriate and counterproductive food aid took place in Hewani in 1984: church and/or government organizations distributed food aid, while the newly rehabilitated irrigation scheme of Hewani had produced about 100 tons of rice in the same year. Such 'famine relief' definitely does not promote a spirit of self reliance.

Also the weak response of farmers to fertilizer experiments indicated that rice growing in irrigation schemes did not have a high priority. Since 1980 the agronomy unit of LTVIP had been implementing on-farm fertilizer experiments in the schemes, but the application of fertilizer in farmers' fields remained minimal. A partial budget analysis -covering 27 Researcher Managed-Farmer Implemented (RMFI) on-farm trials in 3 schemes in the seasons of 1980 to1984- showed that the 7 most commonly used local rice varieties responded well to one bag of sulphate of ammonia per acre (26 kg N per ha). The average yield level rose from 2460 to 2920 kg paddy per hectare[16]. This gain of 460 kg (18 kg paddy per kg N applied) equals a marginal rate of return of 153 per cent[17] (Van Eijk 1985b). Later trials confirmed the profitability of investing in fertilizer. Zoebl (1989a) remarks that application of fertilizer is probably "the single most efficient way to boost the production at present organization and husbandry levels". Nevertheless, most scheme farmers did not apply fertilizer. Apparently they had more urgent priorities.

The average paddy yield recorded in the schemes Mnazini, Hewani and Wema *after* scheme construction and rehabilitation (covering the period 1982-1988; a total of 15 scheme-season observations) was about 2 ton/ha (Zoebl 1989a). With appropriate crop-husbandry, water management and fertilizer application most farmers must be able to produce at least 3.0 tons/ha with their local, long-straw rice varieties. The farmers' willingness to invest labor in sound crop husbandry and water management, and some money in fertilizer, determines whether this yield gap will be closed. Application of fertilizer is most profitable in combination with appropriate crop husbandry measures: i.e., fine-levelling in order to improve water management, a correct plant-density (sometimes requiring gapping: filling in the open spaces to get a uniform plant stand), and timely and sufficient weeding. All these measures, however, demand extra labor-input, although careful fine-levelling reduces labor input in the gapping and weeding operations.

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16. The use of average yield levels can be tricky, since this average covers different locations, seasons, varieties, individual farmer management practices, and overall levels of scheme management, especially with respect to irrigation practice. A statistical analysis of pooled data (across locations and/or seasons) was not attempted because of the confounding of these sources of variation. In order to assess the risks involved in yield variability and price variability a minimum returns analysis and a sensitivity analysis were implemented. Based on these analyses it was concluded that the application of one bag of fertilizer was a profitable and non-risky investment.

17. The minimum acceptable rate of return is between 50 and 100 per cent for a crop cycle (CIMMYT 1988).

More on labor

In the scheme plots with heavy clay soils the land preparation by hoe, the weeding and gapping are the most labor-intensive operations. The initial LTVIP policy on land preparation was that ploughing by tractor was not allowed within the schemes in order to avoid more dependence on external agencies, high production costs, and continual requests to LTVIP to provide such tractor services. This had been an on-going point of discussion between farmers and project staff until in March 1989 permission was granted to make use of tractors in the schemes (Zoebl 1989c). Although ploughing by tractor can reduce the labor-input in land preparation, levelling and weeding, this is only achieved when the ploughing and harrowing are done carefully, and some additional manual labor is invested in finishing off the tractor's job. As mentioned above, the labor-input in gapping and weeding can be reduced through proper water management, which requires, however, a high standard of fine-levelling in the plots. With a constant and uniform water level of a few inches deep even the persistent weed *Cyperus rotundus* can be suppressed (Zoebl 1989c). A properly prepared seedbed, i.e., without too high (dry) and too low (wet) spots, would also guarantee a more uniform germination, and thus less laborious gapping.

In order to facilitate the all-important fine-levelling and to enhance proper water management, LTVIP advised farmers to subdivide the one-acre plots into smaller units by shallow field bunds. Although a few farmers followed this advice and each season again attained higher yield levels than their neighbors, the majority did not copy these examples. Apparently, the labor required for fine-levelling -although later on resulting in less work- could not be spared at the moment of land preparation, and/or other activities had higher priority.

A scheme plot requires more labor in a shorter period of time than a flood-fed field. In a scheme plot more labor is needed for land preparation, gapping, weeding, water management and maintenance of canals. A field that has been flooded by deep water for several weeks does not require much land preparation and weeding, and there is hardly any labor input in water management and maintenance of canals. Although in flood-fed rice fields transplanting is practised (which requires more labor than the direct sowing practised in the schemes), it is done in a staggered way extended over a long period of time. The staggered transplanting -by following the gradually receding water table- makes an even distribution of labor over the season possible. The scheme farmers often have been advised to replace direct broadcasting of seed in the field with raising seedlings in nurseries and subsequent transplanting. They never took up this advice since it was too laborious. Puddling equipment (to make a soft soil for easy transplanting) was not available (Zoebl 1989b).

Project staff had erroneously assumed that the yields in flood-fed fields were considerably lower than in irrigation schemes. Only when in 1984 the agronomy unit of LTVIP started to take samples in the farmers' flood-fed fields, it became clear that the yield levels of these plots had been grossly underestimated. In their eagerness to promote irrigation schemes Kenyan and Dutch staffmembers alike had painted a bleak picture of the local farming system. Although total or partial crop failure definitely occurs once in a while, the farmers harvest a good crop in seasons with adequate depth and timing of flooding. Since several crops (rice, maize, green gram) are planted in small fields on various locations, which are differently affected by the floods, chances are small that all plots will fail. This strategy reduces the risk of complete crop failures (Sprey 1983). Since yield levels in flood-fed fields are higher (up to 3.8 tons of paddy per ha)[18] and labor input smaller than in irrigation schemes, the labor productivity in flood-recession cropping is at least of the same order -if not considerably larger- than in scheme plots (Zoebl 1989b;1990). The labor productivity in the irrigation schemes was around 4 kg of paddy per manday (Zoebl 1989a)[19].

Various economic analyses of rice crop growing in the irrigation schemes indicate that the economic prospects of this enterprise are none too bright (Van Eijk 1985). For example, Van den Berg (1984) calculated that the value-added per manday invested in an irrigated rice plot in Mnazini scheme in the long rainy season 1982 (the first crop after scheme construction) was about Kenyan Shilling 5[20]. The value-added in a flood-fed rice field was also Ksh. 5. In the same period the value-added per manday invested in casual labor was Ksh. 10, and in low-ranked permanent jobs Ksh. 15-20. In the year 1988 the value-added per manday in an irrigated plot in Mnazini scheme was still only half of the casual labor rate (Zoebl 1989a). Thus, seven years after scheme completion the daily returns to labor in Mnazini scheme were still below the rates gained in off-farm opportunities.

With regard to labor allocation the flood- and rain-fed fields most likely will continue to have priority over scheme plots. As soon as the floods recede or the first rains come, the farmers start planting: this will not easily be postponed. After all, this water -as opposed to the water in irrigation schemes- is free. The scheme plots, however, require attention at exactly the same time: the schemes also should, as much as possible, take advantage of free gravity and rain water. But, only when it has become clear that the floods and rains are going to be below expectation, i.e., late in the season, farmers will start land preparation in the schemes. The resulting variation in planting dates makes efficient irrigation virtually impossible, and the pumping costs will be high since no free gravity water can be used. In my view there is no other option than to accept that in the Lower Tana area irrigation schemes will only function at a modest level of efficiency; probably the output per unit water and the labor productivity will remain low in the (near) future. Farmers try to optimize their whole farming system: they do not try to maximize the production of only one component (Underhill 1984). An irrigation scheme that -in the eyes of the engineers- is poorly operated, may be functional from the farmers' point of view: a farming systems perspective prevails.

When the construction and operation of irrigation schemes is so troublesome, why not extend instead the currently small area under flood- and rain-fed crops? An evaluation mission in 1983 argued that the scheme plots should be complementary to the flood- and rain-fed fields; they should not replace these fields (Slabbers et al. 1983). "Irrigation must serve farming and not the reverse" (Leakey 1981). Small-scale interventions in flood-fed agriculture, i.e., the construction of simple engineering works for improved water control in flood-fed fields, would have to get priority over schemes[21]. Expansion of the rain- and flood-fed area, however, is hampered by a lack of labor, threat of wildlife, and social factors. Although the availability of resident farm labor is a limiting factor to expansion of the area cultivated, this is more correctly classified as a priority setting issue.

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18. The flood-fed fields are in general smaller in size than the one-acre scheme plots.

19. The labor productivity in Asia, for comparison, is about 30 kg paddy per manday (Luning 1984;Beets 1990:369). An accurate estimate of the labor productivity in the flood-fed fields in the Lower Tana area is difficult to give, since the available data on yield levels are based on small sampling areas and the reliability of data on labor input is not known to me.

20. In 1982 one US$ = Ksh. 12.5. For the calculation of the value-added per manday the production costs (farmer's payment of communal charges for scheme operation, fertilizer and seeds) are deducted from the yield.

21. In the course of 1985 the Dutch government decided to scale down considerably the level of financing and technical assistance. The recommendation of the 1983 evaluation mission was never implemented.

Many farm-households prefer to allocate labor to off-farm employment opportunities, frequently outside the Lower Tana area, because these give a better return to labor. Especially women, older people and young children remain behind to take care of the farms. Expansion is possible when one moves further away from the villages, but the threat of wild animals (hippos, buffaloes, and baboons) makes this impracticable. Also, the social fabric of Pokomo society makes it difficult to move to land far away from existing villages. And, of course, the low and erratic rainfall and irregular flooding pattern continue to make agriculture a risky enterprise in the Lower Tana area.

4.2.3 *The unruly reality*

There has always been quite some variation in scheme performance: for one and the same scheme over the years as well as between schemes within the same year. The general trend of lowering yields over the years can be attributed to a declining soil fertility and increasing weed population in the years after scheme initiation[22]. The remaining variation can be attributed to differences in availability of gravity water, competition for labor from flood- and rain-fed fields, access to alternative employment opportunities, socio-cultural factors such as level of education and number of wives per man (Vos 1989), the maintenance of the irrigation infrastructure, and finally differences in the degree of group discipline, scheme management and external support.

The average yield in four schemes (Hewani, Wema, Ngao and Oda) in the period 1974-1977 (10 scheme-season observations) was 1.6 ton/ha (Budelman 1978). This was in the period *before* LTVIP rehabilitated these schemes. Although the average yield level *after* scheme rehabilitation was 2 ton/ha, the higher communal charges after rehabilitation resulted in a net yield level that was only slightly higher than before rehabilitation[23]. Already in 1979 it had been concluded that the schemes were as risky as flood-fed agriculture, because of the poor scheme organization (Budelman 1979). An extra labor-input in schemes could not be justified because of the low labor productivity. One can wonder, then, why in 1980 LTVIP was established when these things were already known. Apparently, the urge ‘to do something’ was so strong that a more careful analysis of the reasons behind earlier scheme disfunctioning, and an assessment of ways to overcome the bottlenecks, were skipped.

An example of such an inadequate analysis is the report by the Tana and Athi River Development Authority (TARDA) on the development of village-based irrigation schemes (TARDA 1978). The irrigation scheme in Ngao was used as a case study for future development. Some of the underlying assumptions and my comments on these assumptions -with convenient hindsight- are mentioned in Box 5. In the early eighties a Dutch consultancy firm concluded that in addition to the 200 ha in the then already existing schemes, which had to be rehabilitated, an additional 750 ha could be developed into village-based irrigation schemes. Over a period of six years 20-30 village-based irrigation schemes would be rehabilitated and constructed, in addition to activities to improve the rain- and flood-fed agriculture (Slabbers et al. 1983). In 1989, when the last expatriate staff

22. The initial high fertility of the virgin land in the new irrigation schemes gradually got depleted, since fertilizer application was minimal. The inadequate water management practices resulted in increasingly troublesome weed populations. The expected improvement in water management over the years -resulting from more experience in scheme organization and management, and enhanced group discipline- did not materialize.

23. The communal charges after scheme rehabilitation were about 300 kg of paddy per participating household. Unfortunately, the communal charges in the period 1974-1977 are not given in the ‘grey’ LTVIP documentation. It is certain, however, that these charges were less than after the rehabilitation phase. In this early period the schemes might also have been subsidized by churches and other organizations.

member left LTVIP, only 150 ha (distributed over four villages) had been implemented (Zoebl 1990). The above data show the unrealistic, over-optimistic planning of local and expatriate agencies with regard to irrigation development in the Lower Tana area. These kind of planning exercises mainly favor foreign consultancy firms and their local counterparts. Development planning in Africa is mainly part of the art of government, in which planning goals are used as “carrots rather than as realistic predictions. .. To expect planning to be an important *economic* development tool in the context of the African economies is illusory” (Hyden 1980:230). Hyden’s assertion that development cannot be stage-managed seems to be confirmed by the history of the village-based irrigation schemes in the Lower Tana area.

Box 5: Planning and reality.

- Each farmer gets one acre of rice *and* one acre of bananas in the scheme. In the LTVIP schemes most farmers could not even cope with the one acre rice plots.
- Two rice crops per year are grown and the rice is transplanted. In the LTVIP schemes only one broadcast crop per year was grown. Transplanting was never done, except some gapping.
- The potential rice yield is 4.9 tons/ha/crop. The average yield in the rehabilitated LTVIP schemes was about 2 tons/ha.
- The potential banana yield is 40 tons/ha/year. The average banana yield in the Lower Tana area -outside the schemes- was 7.5-10 tons/ha/year (Zoebl 1987).
- The average labor requirement at full development is 140 mandays/year/holding. The average labor requirement for one rice crop in an LTVIP scheme was estimated at 220 mandays/acre! (Zoebl 1989a).
- The rehabilitated Ngao scheme will be operational in August 1979. The rehabilitation of Ngao scheme started in 1988, but was never finalized.

The future flooding regime of the Tana river is uncertain. Flooding may even cease altogether because of the (planned) construction of barrages, reservoirs, and large-scale irrigation schemes upstream. At that moment irrigation schemes would become an important source of locally produced food. Since training in irrigation management and skill entails a long-term learning process, one can argue that the investments in the LTVIP schemes have been necessary in order to build up experience in irrigated agriculture with the target group. Although LTVIP has not been very successful in integrating irrigation schemes in the existing farming system and in increasing farmers’ income, the learning process of both farmers and change agents may prove useful in the future.

4.2.4 *Conclusion*

The main conclusion is that for successful incorporation of irrigation schemes in existing farming systems, change agents require thorough understanding of the farming system and the farmers’ priorities. Change agents need a farming systems perspective, just as the farmers operate with a farming systems perspective in mind. Although improvement of rain- and flood-fed agriculture was included in the initial project proposal, and re-emphasized by an evaluation mission, it was hardly put into practice.

The complexity of the local farming system was underestimated, and the scientists’ interpretation of farmers’ attitudes tended towards over-simplification. Farmers’ attitudes toward the introduction of irrigation schemes were not interpreted in terms of *their* priorities. The competition for the scarce production factor (female) labor between flood-fed, rain-fed and irrigated fields, and off-farm opportunities, was not recognized and taken into account during project planning and implementation.

Moreover, the fact that irrigation development requires group discipline was not fully appreciated. In order to avoid that farmers become passive on-lookers, it is important that a group-based attitude develops. This learning process takes time, especially so when individual farmers have several exit-options. In this process hard negotiations between farmers and planners/engineers are inevitable. All this hinges, of course, on the assumption that the target group is really interested in irrigation development. This obvious presupposition, however, proved difficult to discern and confirm, because farmers and change agents had different priorities which had to be made explicit.

The -from the engineers' point of view- unsatisfactory performance of irrigation schemes is best assessed with a farming systems perspective in mind. Introduction of irrigation technology is part of a multi-dimensional development process. Agro-technical, economic (for instance, labor productivity), political (the differing priorities of farmers and change agents), and socio-cultural (attitudes of farmers and scientists toward traditional agriculture and irrigation schemes) factors play a role. It is of importance that planners and scientists recognize this multi-dimensionality and shy away from unrealistic planning exercises.

While the Pokomo farmers had little political power at the national level, their countervailing power over regional change agents was considerable, thanks to various 'exit' options. In the terminology of the actor-structure debate one would say that the actors had ample room for manoeuvre. Therefore, the attempt of the change agent (LTVIP) and its local counterpart (the scheme committee) to 'enforce' group discipline among scheme farmers, was not very successful. With a better understanding of the farming systems perspective, and the farmers' priorities derived from this perspective, time and money -now 'wasted' in the struggle between farmers and change agents- might have been saved. The balance of change agents' intervention power and farmers' countervailing power in the 'arena of struggle' between the two groups was delicate (section 3.4). Whereas the farmers certainly had countervailing power over the change agents, this power was not 'large' enough to impose their will on the change agents (e.g., the farmers' request for mechanical assistance in land preparation and fine levelling was not honoured by LTVIP). On the other hand, the intervention power of LTVIP and scheme committee was restricted by their wish and 'need' for farmer participation. In terms of Diagram 5 (chapter 3) one can say that identification (the aspect of group discipline) and compliance (comply with the rules for efficient irrigation as set by the elected scheme committee) are important aspects of irrigated farming (the upper route). In irrigation schemes a dynamic balance between integrative and self-assertive tendencies, between structures and individual actors, seems essential (section 3.4). Schemes can be seen as structures with certain sets of rules and resources, in which individual farmers collaborate and, at the same time, try to stay as independent as possible. A very important component of the attitude toward irrigation schemes was the evaluation vis-à-vis the most limiting production factor labor.

We will return to the development of sustainable irrigation facilities in chapter 9 (Box 18). There it will be argued that the process of negotiation between farmers and change agents can be better understood with the concept 'collective consciousness'. This concept at the interface between irrigation schemes and individual farmers can possibly clarify and facilitate the mutual interaction.

4.3 Uyole Agricultural Centre (UAC), Tanzania. The struggle for adaptive research

4.3.1 *Introduction*

From 1989 to 1991 I worked at Uyole Agricultural Centre, a large research and training institute in the Southern Highlands of Tanzania, located close to Mbeya town (see Map 1). The Southern Highlands comprise the four Regions Mbeya, Iringa, Rukwa and Ruvuma. The research institute counted in 1989 about 50 commodity- and discipline-oriented scientists who were mainly involved in on-station research at the main station Uyole and its seven substations in the ecologically diverse Southern Highlands. Since its establishment in the early seventies UAC got donor support, initially from the Nordic countries, later on mainly from the Finnish International Development Agency (FINNIDA). In 1988 UAC management and FINNIDA agreed that the main thrust in the last phase of the FINNIDA support program (1989-1992) should be research-extension linkages and adaptive research.

These two points of interest were not new. The topics most frequently mentioned by evaluation missions in 1976, 1980 and 1984 were: adaptation of research to smallholders' conditions, prioritization in research topics, collaboration with extension, publication of research results, and mechanization level of the production farm (Van Eijk 1991). Unfortunately, another mission had to conclude in 1987 that the recommendations of these earlier evaluation missions had not been implemented (Nell et al. 1987). Most research still was not relevant to smallholders, too many research topics were investigated, linkages with extension were weak, publication of research results was delayed, and the mechanization level of the production farm was too high. The 1987 mission advised to appoint an expatriate Research-Extension Liaison Officer (RELO) and an expatriate Adaptive Research Adviser (ARA) in order to assist UAC management in implementation of the recommendations. My main task as ARA was to assist local staff in making research more adapted to conditions faced by the main target group, i.e., the smallholders.

In 1989, after almost 20 years continuous donor support, the research institute was well equipped with a large, highly trained staff and adequate transport facilities. FINNIDA provided funds for research activities and night-out allowances. Although transport facilities and funds are never enough to satisfy each individual staff member, UAC definitely was one of the best-equipped research institutes in Tanzania. In the two decades of its existence UAC had contributed to agricultural development in the Southern Highlands via improved crop husbandry methods and the release of new varieties. It is difficult to tell what the precise impact of UAC has been since many factors influence agricultural development. In 1989, however, the majority of the farmers had not, or only partially, adopted UAC recommendations. The large group of resource-poor farmers did not have access to the high levels of external inputs required for implementation of the scientists' recommendations. In maize demonstrations of the FAO Fertilizer Program the recommended N level was 100 kg N/ha, and in maize on-farm trials N levels ranged from 0 to 180 kg N/ha. However, when all fertilizer imported in Mbeya Region in the season 1987/88 would have been distributed equally over the total cultivated area, about 14 kg N per hectare of cultivated land would have been available (Van Eijk 1989).

The collection of data in surveys was not the main problem at UAC, but analysis and interpretation of data proved to be the most difficult part (Croon 1980). In other words, the translation of survey results in research priorities -the feedback function from diagnostic work to on-station research- was the bottleneck. Surveys had been implemented at UAC since the early seventies, but the impact on the research agenda remained limited (we will return to this issue of weak priority setting in section 5.1: operational problem no. 6). Only in January 1990 a full-fledged FSR team was established at UAC. Before 1990 the one and only agricultural economist at UAC had to take care of FSR activities with ad hoc assistance from some on-station researchers. In 1990 an agronomist and livestock specialist joined the FSR team, later on supplemented with a sociologist.

The question is why the earlier mentioned recommendation of various evaluation missions - to adapt research to smallholders' conditions- had not been implemented? For the time being, we can conclude that a regular evaluation of donor-supported activities without a proper follow-up on *implementation* of recommendations is rather meaningless. It is clear that neither UAC management and staff nor the donor agency had been very strict on *implementation* of recommendations. It is of interest to note that the evaluation reports only focused on what UAC should do to adapt research to smallholders' conditions; there was no advice in respect of what the donor agency should do when recommendations were not implemented. Especially in the early years of donor support large numbers of expatriate scientists worked at UAC. For that reason the donor agencies can be held co-responsible for the high level of mechanization at the UAC production farm, the high level of external inputs used in experimentation, and the virtual absence of social scientists. Although in the early seventies these conditions were part and parcel of a generally accepted research policy, the adjustment of this policy in later years was inadequate. At the same time, the Tanzanian government policy was also directed towards a 'modernization' of agriculture, as expressed in the popular phrase 'kilimo cha kisasa' (modern agriculture). In later years when most expatriates had left, UAC management and staff showed little initiative to adjust the research policy to new insights emerging in the international agricultural community - and as expressed in the recommendations of various evaluation missions. In my judgement UAC, Ministry of Agriculture and donor agency had a joint responsibility to rectify earlier mistakes.

At the beginning of my stay at UAC I soon found out that the job descriptions of the RELO and ARA had never been discussed with the staff of the institute. The staff had only vague ideas about our tasks. Neither the donor agency nor UAC management had bothered to explain the tasks of the newly appointed expatriates to the parties concerned. In order to remedy this fault RELO and ARA distributed their job descriptions among the staff members. Nevertheless, it remained difficult to orient research more to the resource-poor farmers. The 'hidden agenda' of many (underpaid) scientists was to maintain as much as possible the status-quo, since any change in research policy required extra time that could be spent more profitably in other income-generating activities (and they were right from their point of view).

Box 6: Salaries, allowances, and performance evaluations

The payment by the donor agency of night-out allowances for off-station work resulted in (indirect) topping up of local salaries (which in my opinion can be a legitimate project objective), but the problem was that the control and follow-up of these allowances was difficult, if not impossible, to implement. Since the allowances were high in comparison to the local salaries, researchers were tempted to spend more days off-station than was strictly necessary for research purposes, and thus to increase their income. To put it bluntly: the more inefficient you were in the implementation of your duties, the more money you got. When the gap between local salaries and (mainly donor-paid) allowances is large, promotion of inefficiency can be the result. This indirect topping-up of local salaries (via night-out allowances) is counterproductive to efficiently implemented and relevant research work. In my view, *direct* topping up of local salaries (i.e., direct increases in salary rates, and realistic night-out allowances to cover actual expenditures) is a more effective way to promote efficiently implemented and relevant research work. The topping up, however, should be linked to a regular evaluation of researchers' performances[24].

24. For more on topping up of local salaries -linked to performance evaluation- I refer to Box 4. I do not want to imply that *all* UAC staff members made improper use of night-out allowances. Far from it! One can also argue that it was a miracle that some staff members did such a fine job under the prevailing miserable salary conditions. I estimate that about 25 per cent of the staff at UAC were motivated researchers who tried to make the best of it.

Meanwhile, the expatriate advisers were caught between a rock and a hard place. On the one hand we sympathized with the local researchers, on the other hand the donor agency wanted to see results. This, inevitably, sometimes resulted in frictions. Maxwell (1986c) refers to social scientists who worked in 'traditional' research stations, and returned from their experiences to write "with varying degrees of euphemism, of 'institutional difficulties' .. 'creative conflict' .. or 'internal friction' ..".

> "Teamwork requires and rewards the questioning of each others' assumptions, although these are defended and attacked emotionally as well as rationally" (Hansen 1986)

4.3.2 *Failures of extension or failures of research?*

In 1991 UAC again was visited by an evaluation mission. Table 4 originates from the report of this mission (McLean et al. 1991). The 1991 mission stated that "the weakness in the extension services reflects, to a great deal, the low yields in villages". Extension was blamed for not transferring -supposedly sound- recommendations to the farmers. It was taken for granted that the technology itself was suitable for the vast majority of resource-poor farmers. That looks suspiciously like the traditional Transfer of Technology model! While all the previous evaluation missions had emphasized the necessity to lower input levels in research, the 1991 mission had an opposite opinion. According to this mission UAC should implement all its research at high input levels. In one way or another the mission did not recognize that for the last 20 years UAC had been doing exactly that! Maize breeding and testing of maize varieties, for instance, was up to 1991 done at 150 kg N/ha (see Box 2 for a similar situation in Mozambique). The mission suggested to combine on-the-shelf research findings into packages. This, to my mind, would have resulted in impossible cash and labor outlays for most farmers.

Table 4: Productivity levels of maize in Southern Highlands of Tanzania

Location	Productivity (tons/ha)
On-station trials	7.0-8.0
On-farm trials	5.0-6.0
Smallholders' fields	1.0-1.5

An argument put forward by some UAC scientists was that they included also lower input levels in their trials. In an on-station fertilizer experiment, for example, the N treatment ranged from 0 to 150 kg/ha. Based on these lower levels, they claimed, recommendations for resource-poor farmers could be formulated. In this context it is important to distinguish between experimental and non-experimental factors (see Box 2). In my view the experimental factor (N level) must include the current farmers' level and one or more higher, but realistic, levels which the majority of the target group can replicate in the nearby future, let's say 5-10 years from now. At the same time the non-

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This indicates that salary is not the only determining factor. Apparently, commitment to the job is also influenced by other factors. Factors, which might pertain to the lower route in Diagram 5 (chapter 3).

experimental factors should reflect the management level of smallholders in order to make on-station research more relevant to their conditions[25] (Mutsaers 1991:46). The application of these simple rules would significantly increase "the relevance of applied research and accelerate the process of developing appropriate technologies" (Merrill-Sands & McAllister 1988:7). When on-station research would be implemented with this in mind, then the results could be combined in realistic packages. On-farm testing, however, is still necessary because farm-households are engaged in several activities (various crops, livestock, off-farm employment) that can compete for the same scarce resources. The farming systems perspective has to be taken into account. The report of the 1991 mission strongly creates the impression that the distinction between experimental and non-experimental factors, and the farming systems perspective, had been overlooked.

The 1991 mission pointed out that the benefit/cost ratio of fertilizer use was high. The fertilizers, however, did not arrive in time, or only in limited quantities, in most villages. The fact is that after many years of fertilizer demonstrations -the FAO Fertilizer Program for example operated since 1979 in the Southern Highlands- most farmers used no or only limited quantities of fertilizer. Why, then, did not farmers adopt such a profitable innovation? Simply because the inputs were not available, the produce could not (always) be marketed, and unrealistic prices were used in the calculation of the benefit/cost ratios. In my view scientists have to adapt themselves to these realities of farmers' life, not the other way round. One should try to avoid the trap of the 'scientific imperative' which is "creating blindness to practical implementation problems" (Röling 1988:113).

Real farm-gate prices must be used to calculate benefit/cost ratios. In mountain villages, located only 30-40 km from a tarmac road, the price of a bag of fertilizer could be double the price in Mbeya town. On the other hand, the end produce maize sometimes had to be sold for half of the offical price in remote villages. Although private traders in easily accessible places paid for maize more than the official government-set price, in remote villages they paid less than the official price because of the high transport costs. Another factor to be kept in mind is that the fertilizer response in farmers' fields is considerably less than in demonstration plots because overall crop husbandry is unlikely to be optimum. Moreover, farmers paid only 40 per cent of the real cost of a bag of urea fertilizer in 1989 (Van Eijk 1989). Since the government in recent years abolished subsidies on fertilizers, the prices increased sharply. Taking into account all these factors, the real benefit/cost ratio for smallholders living at some distance from larger towns was considerably smaller than assumed by the 1991 mission.

Another example of the inability of the 1991 mission to recognize the wider causes of non-adoption is the reported farmers' negative opinion about extension agents. The mission referred to the obvious lack of incentives and transport facilities with extension staff, but failed to mention that many extension agents lost their credibility, because of the unrealistic recommendations they made in the past, and regrettably some continue to make up to today. Collinson (1987b:169/170) says:

> "Historically, the promotion of *inappropriate technology* is inimical to mutual respect between extension workers and farmers and disastrous to service morale and effectiveness. ... Confidence by the field contact staff in what they are promoting is a sound basis for solid morale in the extension services" (my italics).

25. In maize variety trials, for instance, the nitrogen application is a non-experimental factor which should be kept at a realistic level. Instead of 150 kg N/ha, one could apply 50 kg N/ha, which for the large group of resource-poor farmers in the Southern Highlands would be a level which they hopefully can apply in the nearby future.

Failures of adoption are probably less failures of extension than failures of the technologies developed by scientists (Vallaeys et al. 1987:160). In the mission's report one crucial thing was missing, namely the *content* of the training courses for village extension workers and seminars with subject matter specialists. As said earlier, the assumption was that UAC had on-the-shelf research findings that could be translated into extension recommendations for resource-poor farmers without further testing.

An issue which most evaluation missions failed to recognize was the low quality of field experimentation, as expressed in the high level of coefficients of variation in many on-station and on-farm experiments at UAC (Van Eijk 1991)[26]. Although most researchers calculated coefficients of variation, no attempts were made to explain high values and no measures were proposed on how to lower these values in following seasons (see Box 2). Inappropriate experimental designs and poor statistical analyses of trial results were rather frequent phenomena. Apart from the fact that many experiments were irrelevant for the target group, the trials at least could have been properly designed, implemented and analyzed. A substantial reduction in the number of trials would make more time available for careful planning (including appropriate experimental designs), implementation, analysis (statistical, agronomic, economic, and farmers' assessment), publication of experimental results, and dissemination of research findings (Van Eijk 1989). In short, quality above quantity.

Contradictory recommendations of different evaluation missions make it difficult for recipient organizations to establish consistent, long-term research policies, especially in the absence of strong, local research management[27]. It is important that reseachers as well as donor agencies are really committed to the cause of resource-poor farmers: without such commitment it is difficult to develop effective and relevant research. With regard to this commitment Croon, an expatriate economist who worked several years at UAC, says:

> "the civil servant-bureaucratic-minimum-level-working type of attitude, which so easily develops in a non-commercial institution must be fought against, as it is not compatible with the kind of dynamic environment and commitment necessary for successful research activities" (Croon 1982).

The realization of a common sense of 'mission' in on-station and on-farm research is a long-term objective, that requires sustained commitment of senior research management. A shared, applied, farmer-oriented perspective to research entails nothing less than:

> "forging a client-based institutional culture and motivating researchers to adopt such a culture. The challenge is that such a consensus generally requires modifying professional values and concepts of 'good science' taught to researchers during their specialized training" (Merrill-Sands & McAllister 1988:26).

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26. It is surprising that local and expatriate scientists, and visiting missions (only the 1984 mission mentioned the issue), had not noted this problem of high coefficients of variation earlier. Because of my constant emphasis on the quality of field experimentation -as expressed in coefficients of variation- I was nicknamed Mr. c.v. in the research institute (I consider this a honorary title). I do wonder, however, whether members of the various evaluation missions ever studied any research reports, or visited field experiments? See Box 3 for a similar observation made in Mozambique.

27. It is advisable that donor agencies try to avoid inconsistencies in recommendations of evaluation missions by insisting on professionalism -i.e., relevant work experience and familiarity with recent literature- in the selection of team members for evaluation missions.

The adoption of a more farmer-oriented perspective by UAC researchers *and* management inevitably is a slow learning-process. The interpretation of the concept ‘good science’ by the majority of the UAC researchers proved to be problematic. On the one hand, the (statistical) analysis of a considerable part of the experiments was superficial and incomplete, i.e., not done according to standard text books. On the other hand, the relevance of many experiments to the target group of resource-poor farmers was questionable. Collaboration between the commodity- and discipline-oriented researchers was largely absent: most scientists were working within the narrow boundaries of their disciplines[28].

Linking agricultural research to farm practices involves a confrontation of different groups of social actors who structure their behavior in distinct ‘life-worlds’ along the particular ‘logic’ of that specific life-world (Andersson 1993). This results in differing priorities of farmers, scientists and extensionists. The differing priorities of scientists and farmers appear also in the comments of the Mbeya Regional Integrated Development Project (RIDEP) on UAC (Box 7). These comments support the recommendations of the evaluation missions of 1976, 1980, 1984 and 1987.

Box 7: Some criticisms of the Mbeya Regional Integrated Development Project on UAC (FAO 1983:141).
- concentration on single crops in isolation from other crops in the farming system;
- concentration on technical (usually high input, high output and often high risk implied) factors and the neglect of social and economic criteria, with technical criteria usually concentrating on returns to land instead of more relevant returns per man-day or unit of capital;
- inadequate rational determination of research priorities, reflecting rather staff interests and expertise than the needs and priorities of the region;
- non-area specific research: most of the research is concentrated at UAC itself and is ‘top-down’ rather than ‘farmer-participatory’;
- “researchers have to learn to think like farmers in order to understand the latters’ decisions and decision criteria” (Government of Tanzania/FAO 1982:316).

4.3.3 *Indifference to actual farming conditions*

In the season 1988/89 the total number of on-station experiments at UAC was about 200, with most of these trials being replicated at several substations. The number of on-farm experiments was about 20 (10 per cent of the number of on-station trials) (Van Eijk 1989). The number of experiments that focused on alternatives to high-external-input agriculture was about 30 (13 per cent of the total number of on-station and on-farm trials) (ibid.). These alternatives dealt with topics such as green manure, alley-cropping, and rock phosphate. These figures indicate that there was quite some room for expanding research on low-external-input or resource-efficient agriculture. Many practical problems with respect to low-external-input agriculture remain to be solved, but on the other hand, as long as the main research thrust is directed towards high-external-input agriculture one cannot expect to find solutions for these problems. It is logical that little ‘alternative’ technology is available, since it has received only a small portion of the total research budget.

28. In 1989 the RELO and ARA proposed to establish a Soil Productivity Committee in order to find solutions for the complex and comprehensive problem of declining soil fertility in the Southern Highlands. A multi-disciplinary team of scientists would work in an inter-disciplinary mode on this problem, so that sustainable technology could be developed. Unfortunately, the Committee just lingered on without producing tangible recommendations.

Another indicator of the focus on high-external-input agriculture was the large percentage of the budget for on-station research spent on testing of varieties and breeding work (Table 5)[29]. One can seriously doubt whether breeding and variety testing should get such a high priority. In a national workshop on agricultural research Semuguruka (1988) asked:

> “Why continue developing new maize varieties [in Tanzania] at the present rate when there are about 13 varieties on the market and yet the percentage of farmers using these improved varieties is only about 12 percent!”

Many experiments have shown that the introduction of high-yielding varieties should follow, not precede high standards of crop husbandry (Acland 1971:130; De Geus 1973:94; Reddy et al. 1989). In Zambia single factor improvements such as early planting, recommended density and appropriate weed control gave a similar yield increase in maize as use of an improved variety, or application of fertilizer (Reddy et al. 1989). Whereas the combination of high standards of crop husbandry and improved varieties gives the highest yields, it is obvious that the majority of the resource-poor farmers in East Africa cannot adopt such complete technological packages. The external inputs (seed and fertilizer) are not (timely) available and/or too expensive, and labor constraints in the peak periods of planting and weeding make optimum crop husbandry impossible. Hitherto research has provided little advice to resource-poor farmers on how to manage the inevitable trade-offs in their compromised crop management (Carr 1989:in Blackie 1994).

Table 5: Percentage of budget spent on breeding/testing of varieties and on agronomic research at UAC in the season 1989/90.

Crop	Breeding/testing	Agronomic research
Wheat/triticale & barley	99	1
Rice	86	14
Round potatoes	75	25
Maize	54	46

The large gap between the actual and potential maize yield in the Southern Highlands (Table 4) makes efforts to increase on-station yields to levels above 8 tons/ha quite superfluous (see Box 2 for similar remarks with regard to the Mozambican situation). More emphasis on agronomic work is needed. Advances in crop improvement through breeding must be matched with advances in crop husbandry practices (Blackie 1994).

> “Although the overall unexploited yield increase is much less than that frequently asserted by plant breeders, well focused agronomic research, which will point the way for smallholders to build up and maintain soil fertility levels, is essential even to realize this modest potential. ... The IARCs have encouraged a strong bias towards plant breeding in their efforts to revitalize African agriculture but have shown less capacity for addressing the more complex crop management problems. The overall support from international science for the development of high quality crop husbandry research in

29. The calculation of the percentages in Table 5 is based on the research proposals for the season 1989/90. The very low percentage of the wheat/triticale & barley program spent on agronomic research was due to the absence of the agronomist in that particular season.

> southern Africa is dwarfed by that for crop breeding - to the detriment of long-term sustained agricultural productivity across a broad base of smallholder farmers" (Blackie 1994).

Although 75 per cent of the research budget was spent on breeding/testing of varieties (Table 5), the impact of the potato variety selection program was rather limited (Andersson 1993). The most widely grown potato variety in, for example, Uporoto area (an important potato growing area in the Southern Highlands) was not a UAC introduction, but a variety introduced by migrants returning from the Northern Highlands. A monitoring system for released varieties did not exist. Once a new variety had been released, no follow-up was given by researchers to monitor the adoption by the target group. Scientists at UAC, generally, blamed the seed industry and/or the extension service for non-adoption. The performance and suitability of new varieties was rarely questioned. With regard to research on improved maize varieties Friss-Hansen (1988) concluded that very few results, applicable to resource-poor farmers in the Southern Highlands, had been produced by UAC. Hybrids and high-yielding varieties are bred to perform well under favorable growing conditions (De Geus 1973:94). It would be more appropriate to call these improved varieties 'high-response' rather than 'high-yielding' varieties, since these varieties, without fertilizer and pesticide applications and under poor crop husbandry conditions, do not always perform better than local varieties.

The switch from traditional varieties to higher yielding modern varieties can be tricky in the sense that farmers are tempted to abandon practices such as crop-rotation and mixed/inter/ relay cropping in favor of continuous, unbroken stands of modern varieties.

> "Poorer farmers, because poverty compels them to value immediate income highly over future income, are especially liable to temptation - above all if doses of nitrogenous fertilizers can be reduced substantially below recommended levels with little loss of profit and much risk-reduction *this* season, at the cost of possible sharp falls in soil fertility later, perhaps much later" (Lipton & Longhurst 1989:46).

However, there is no free lunch. The extra nutrients required for the higher yields of modern varieties, without additional fertilizer applications, must come from somewhere. Modern varieties can be better at extracting soil nutrients than traditional varieties, but in the long term this may result in 'soil mining' (ibid.). Soils in Njombe District in the Southern Highlands, which had been continuously cultivated for 10-15 years with maize, showed a lowering yield level and decreasing organic matter content, and a deteriorating soil structure[30] (Friss-Hansen 1988). It is, therefore, unlikely that the mono-culture of maize, which has developed in some areas of the Southern Highlands, will be ecologically sustainable in the long term.

Although UAC had a large number of qualified researchers with enough possibilities to get in touch with farmers, most on-station research was rather irrelevant to the main target group, i.e., the large group of resource-poor farmers. Most researchers at UAC were sons and daughters of small-scale farmers *and* they were, in addition to their job as researcher, also engaged in private farming activities in order to supplement their low salaries. One would expect, therefore, that they were well aware of smallholders' problems and that they used this knowledge in planning their research programs. Unfortunately, this was not always the case. The majority did not incorporate the actual farming conditions under which resource-poor farmers had to operate, in their research programs. This could be due to the following four factors:

30. Although the director of UAC confirmed in a newspaper interview (Daily News 22-8-1989) these observations, no adjustments in research policy were made.

1) Researchers are trained -at home (B.Sc. level) as well as abroad (M.Sc. and Ph.D. level)- in so-called ‘modern’ agriculture (Western, highly specialized, high-external-input agriculture) which alienates them from actual smallholders’ conditions (Beets 1990:602; Andersson 1993);
2) The part-time, private farming activities of UAC researchers took place under quite privileged conditions, such as easy access to relatively cheap chemical inputs and tractor services. This can have distorted their view of conditions of production in more remote villages in the area;
3) Twenty years continuous donor support resulted in an elaborated infrastructure and an attitude not very conducive to research for resource-poor farmers. Initially the donor agencies did not emphasize research for resource-poor farmers, and later on, when they did so, no follow-up on implementation of recommendations by the various evaluation missions was made.
4) Considerable political pressure to transform ‘traditional’ smallholder farming into ‘modern’ agriculture can have influenced the priority-setting of Tanzanian scientists. The party policy paper ‘siasa ni kilimo’ (politics is agriculture) of 1972 led to a belief that “extension could be undertaken by all political leaders and administrators”, often possessing little agricultural expertise (Lubawa 1985). Extension work became political mobilization of farmers who were ‘asked’ to expand their acreages, or to cultivate communal farms. Up to today politicians and administrators speak in Tanzanian newspapers about agricultural modernization, implying tractor mechanization and high-external-input agriculture. Moreover, a long-term consistent agricultural research policy has been missing. Many research and extension programs in Tanzania were of an *ad hoc* nature. Campaigns were the favorite mode of policy.

> “Thus operations such as ‘chakula ni uhai’ (food is life), ‘nguvu kazi’ (work is strength), and ‘kilimo cha kufa au kupona’ (agriculture as a matter of life or death) are examples of *ad hoc* programs which were undertaken with great fanfare and then faded almost into oblivion after a year or two” (Lupanga 1986).

Although government officials sometimes emphasized that low-external-input agriculture was the only viable alternative for Tanzania (see for instance Nyerere’s opening address to the workshop on resource-efficient farming methods for Tanzania: Nyerere 1983), the general research policy was not directed towards resource-poor farmers.

UAC’s visitor’s guide (Extension leaflet N.32 of 1984) says that oxen are the best source of power in the agricultural systems of the Southern Highlands. Unfortunately, these words were not put into practice at UAC itself. The mechanization level of the production farm was too high according to various evaluation missions. The fixation on ‘modern’ agriculture made that animal-power based technology was seen as a step backwards, while in reality the transition from hoe to animal power would be a true revolution at the countryside, especially for women. A ‘modernization’ of Tanzania’s agricultural system could result in mass unemployment and social chaos. A resource- and job-conserving, low-external-input agriculture would be more appropriate (Gabel & Heiland 1983). A labor-oriented agriculture with maximum exploitation of improved handtools and animal draught power, eventually followed by mechanization, seems to be a better option (Beets 1990:72). Although much past research has been rejected by African farmers as too labor-intensive, it is also true that populations are growing at 3 per cent per year, about 80 per cent of the labor force finds employment in agriculture (Table 1), and prospects for urban labor absorption are meager. Research, therefore, should focus on raising yields “in ways that substantially raise the demand for labor” (Lipton & Longhurst 1989:342).

With regard to the indifference to actual farming conditions I want to emphasize that agricultural research -and thus also FSR- is only one component in the *mix* of conditions that must be taken care of in order to facilitate rural development (section 1.1). Other components in the multi-dimensional process of rural development -such as an adequate infrastructure, input supply, credit, marketing, land tenure and price policy- must be taken care of before research and extension can begin to make a difference. This brings us back to the conceptual confusion with regard to the holistic aspect of FSR (section 2.4): the delineation of the *whole* farm system is problematic. Which components in the mix should be treated as endogenous variables and which as exogenous parameters? In the Anglophone FSR approach -the common approach in East Africa- one has chosen to adapt research to the external conditions, which are seen as largely given. As a practice-oriented field agronomist I support this choice: what can a resource-poor farmer or agronomist do about infrastructural bottlenecks or inappropriate price policies? After all, it is unlikely that the countervailing power of resource-poor farmers in East Africa rapidly will increase. At the same time, however, it is clear that infrastructural bottlenecks hamper the effectiveness of investments in agricultural research. In recent years the tendency in FSR is to treat more and more institutional factors as potential leverage points (section 5.1: operational problem no.1). The farming systems perspective is enlarged. Whether the problems of practicability, implied in an enlarged farming systems perspective, can be solved, remains to be seen (section 2.4).

To my mind it is fair to argue that the initial FSR approach held a too optimistic view on the impact of research and extension on agricultural development. In The Netherlands, for example, public investments in resource development (land consolidation) were instrumental in the construction of an appropriate *mix* for agricultural development (Röling 1988:190). Improved drainage, decreased fragmentation, and reduced distances between buildings and land played an important role in agricultural development. The various elements in the mix are not additive, but (should) work synergically (ibid.:166). When one essential element in the mix is absent or weak, the whole ‘chain’ or ‘web’ suffers. The relatively limited impact of UAC on agricultural development in the ecologically diverse Southern Highlands certainly can be (partly) contributed to inadequacies in the mix. The question remains how in the rainfed, diverse and risk-prone farming systems of East Africa synergy in the mix can be created (we will return to this matter later). At this point I just want to emphasize that in the location-specific farming systems of East Africa the central position of farmers as experts at adaptive management requires more attention (section 3.1).

4.3.4 *Conclusion*

The question raised in section 4.3.1 -why has the recommendation to adapt research to the conditions of resource-poor farmers not been implemented?- can be re-phrased as follows: why has it been so difficult to introduce a client-oriented institutional culture and a farming systems perspective into UAC? The following answers have been provided:

- The low salaries of researchers have promoted a tendency to maintain as much as possible the status-quo.
- The government, senior research management and scientists have not been really committed to the cause of resource-poor farmers. Or, alternatively, one can argue that resource-poor farmers did not have sufficient countervailing power to ‘enforce’ this commitment.
- Initially also the donor agency had not been committed to the cause of resource-poor farmers. Later on the donor agency did not possess effective means to change the research policy, i.e., the intervention power of the donor agency was limited (the proposed topping up of salaries would give

the donor agency a possibility to address the tendency to maintain the status-quo, *and* it would provide a means -through performance evaluation- to change the research policy).
- Many scientists were indifferent to actual production conditions of resource-poor farmers, caused by, among other things, a training focused on high-external-input agriculture and a narrowly conceived disciplinary education. Identification with the target group of resource-poor farmers proved troublesome.
- Scientists frequently exhibited a tendency to blame extension for non-adoption, rather than to shoulder responsibility for inappropriateness of technology. The attitude toward non-adoption was not based on self-evaluation, but rather on evaluation vis-à-vis another change agent.

All above-mentioned factors refer to the upper route in Diagram 5 (chapter 3). The long history of non-implementation of recommendations made by evaluation missions indicates that adaptive research for the target group of resource-poor farmers requires a change in attitude with scientists, senior research management, local government and donor agency. It looks as if these actors lacked commitment to resource-poor farmers. Real commitment of on-station researchers and FSR practitioners would translate into relevant and high quality research work, i.e., it would become visible in the planning, implementation and analysis of field experiments and other activities. In order to advance commitment to resource-poor farmers, it might be cautious to focus not only on the upper route, but also on the lower route. Since more countervailing power with resource-poor farmers, higher salaries, and rapid changes in educational systems are not very likely to be realized in the near future in Tanzania, it might be imprudent to focus single-mindedly on the upper route.

4.4 Farming Systems Research Team-Western Province (FSRT-WP), Zambia. The trade-off between quantity and quality.

4.4.1 *Introduction*

From 1994 to 1996 I worked in Zambia in the Farming Systems Research Team-Western Province (FSRT-WP)[31]. Western Province is one of the least developed provinces in Zambia with a mainly agropastoral subsistence economy and a high percentage of out-migration. About 30 per cent of the rural households are headed by women (Vierstra & Ndiyoi 1994). Since the province is not self-sufficient in food, annual imports of the main staple food maize are necessary. The FSRT-WP is based at the Mongu Regional Research Station, the provincial research station which is also the home of some thematic and commodity researchers. The agricultural extension branch of the Ministry of Agriculture, Food and Fisheries is located in the same building. FSRT-WP which started in 1981 has been co-financed by the Dutch government since December 1982. In 1994 the FSRT-WP consisted of five disciplinary sections: agronomy, livestock, economics, sociology, and a research-extension liaison office with in total eight national and expatriate researchers. The technical field staff consisted of extension officers seconded to FSRT-WP by the extension branch, and some individuals employed by FSRT-WP. My main task in FSRT-WP was on-farm and on-station research[32]. The long term objective of FSRT-WP is:

> "To plan and implement adaptive agricultural research programs in Western Province, of an interdisciplinary nature in a farmer participatory operational mode, resulting in gender sensitive recommendations that help in improving productivity and livelihoods of small-scale farmers on a sustainable and equitable basis" (Norman & Mwenya 1993).

This definition of the long term objective indicates how difficult a task FSRT-WP faces. All the recent trends in development cooperation are present in the definition: interdisciplinarity, farmer participation, gender sensitivity, sustainability, and equity. On the one hand, all these concepts *should* figure in a comprehensive FSR program, but on the other hand the implementation of these concepts in daily practice is problematic, as this case will show.

4.4.2 *Farmer participation*

Since the 1991/92 season FSRT-WP works with Farmer Research Groups (FRGs) rather than individual farmers. Most on-farm research activities are implemented in collaboration with these FRGs which consist of about 15-20 farmers. The FRGs are involved in farmer field days, in various meetings in which on-going on-farm trials are discussed in the course of the agricultural season, in preparatory meetings shortly before a new season starts, and in the household monitoring program and specific surveys. At all these occasions researchers receive feedback from farmers. While several authors (a.o., Norman & Mwenya 1993; Mutsaers 1994) are positive about FSRT-WP's

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31. Before 1994 the Farming Systems Research Teams in Zambia were called Adaptive Research Planning Teams (ARPTs).

32. My first year at FSRT-WP I was besides agronomist also Deputy Coordinator of FSRT-WP and team leader for the expatriate staff members. These additional administrative duties took so much time that the agronomic work suffered. From the start of FSRT-WP in 1981 untill 1995 the agronomists have always been (Deputy) Coordinator and team leader, which is one of the reasons why a backlog in analysis of experiments developed.

contribution to methodological innovation through FRGs, Kaluba (1995) is not optimistic about the improvement in feedback to and from farmers through FRGs. In his view the researcher-farmer dialogue through FRGs remains rather one-sided with a mode of farmer participation which is more consultative than collaborative. Also Vierstra & Ndiyoi (1994) remark that farmers do not participate directly and systematically in priority setting for research.

According to Kaluba (1995) the entire priority setting is done at the research station. In his view the researchers' approach to planning is too rigid, too rationalistic time fixed while farmers operate more intuitively in a stepwise process of muddling through[33]. It is probably true that especially in donor-funded projects the (externally imposed) need to meet dead lines is a hindrance to more effective farmer participation. Working with FRGs proved to be time-consuming.

> "FSRT-WP has seriously underestimated the workload involved in guiding the FRGs. Properly explaining, regular guidance of the groups and their members, and detailed monitoring are extremely time consuming interdisciplinary activities, that cannot be left to the field technicians" (Sichinga & Stoop 1993).

The development of trust between farmers and researchers takes time, and the rules of collaboration have to be explained again and again. The 'recipient' or 'dependence' attitude of farmers (Kaluba 1995) has to change before effective collaboration can develop. The so-called 'dependence' attitude of farmers, however, can also be interpreted differently. From a superficial point of view farmers seem to be dependent, but in reality -as Hyden (1980) argues- they are independent since they control the production factors land and labor. The simple fact that the farmers are smart enough to try -time and again- to squeeze the maximum possible out of FSRT-WP, does not imply that they are dependent on FSRT-WP. They want to gain as much as possible, *and* stay independent. Since farmers have 'exit' options, the actual power to take decisions remains with farmers (section 1.4).

To my mind assumptions on homogeneous villages and on collaboration without (sometimes vigorous) negotiation are naive. The farmer/researcher encounters are characterized by 'cooperative conflict' (Kaluba 1995) which probably is inevitable. For example, some influential farmers (especially retired government and parastatal workers) requested for research into exotic crops such as wheat and potato, or for tractor services. FSRT-WP could not honor such requests because of their irrelevance to the majority of the farmers. This can be interpreted as a paternalistic attitude of scientists, but FSRT-WP had to guard against a domination of the group activities by a few more vocal farmers. Having said this, one also has to admit that paternalistic attitudes towards farmers *are* still quite common in the research and extension establishment. The teacher-pupil attitude of the last group and the problems of token participation with farmers are not easy to solve. Kaluba (1995) offers no concrete suggestions on how to handle these problems, except the recommendation to work as much as possible with homogeneous, preferably multiple-issue FRGs. More homogeneous groups would facilitate collaborative participation, and groups which are established for several purposes (not only on-farm research, but for example also income generating activities) are more sustainable. A possible drawback of homogeneous FRGs is that FSRT-WP has to cover various categories of farmers, and cannot increase the number of FRGs.

Another aspect of the researcher-farmer relationship is the gender dimension, which in fact is merely a fine-tuning of the target group concept (FSRT-WP 1995). Ideally, gender concerns should

33. This statement of Kaluba (1995) creates the impression that only farmers operate intuitively. As we will see later on, also scientists operate, at least partially, intuitively but they are reluctant to admit this.

be explicitly and systematically included in all phases of the FSR process. Although on average 40% of the members of FRGs are female farmers (of both male- and female-headed households), the presence of some dominant and influential male group members can limit women's contribution to discussions, as well as the contribution of less outspoken male members. A general recommendation of a gender support mission to FSRT-WP was to train trial assistants, extension officers and farmers in group dynamics, facilitation of meetings, discussion techniques and leadership skills (FSRT-WP 1995). Whereas such training certainly could contribute to gender sensitivity and more collaborative participation of farmers in general, it is unavoidably a slow process and it requires capable and motivated staff to provide this training. Since many local researchers (male and female) are caught between their awareness of gender issues and the prevailing societal situation, a willingness to whole-heartedly redress existing imbalances cannot always be expexted. It requires a combination of will and skill. And FSRT-WP will have to scale down on its number of activities (research themes and number of FRGs) if more time has to become available for professional interaction with farmers.

In the end any choices with regard to priority setting in research (which topics, for whom, and where and when) should as much as possible be made explicit, debated and underpinned with sound argumentation. Differences in 'lifeworlds' between the multiple actors, and in power and knowledge, are -and will remain- inevitable. Perhaps only empathy with the target group of resource-poor (female) farmers can compensate for these anomalies.

4.4.3 *Complete analyses*

FSRT-WP had an over-ambitious work program (Norman & Mwenya 1993;Vierstra & Ndiyoi 1994; Mutsaers 1994; Van Eijk 1995a). Although during the last few seasons FSRT-WP reduced the number of activities, in my judgement a further cutback is necessary[34]. In the season 1994/95, for example, on-station and on-farm experiments had to be planted before the trials of the previous season(s) had been adequately analyzed. Being a field agronomist that goes against the grain with me. Although FSRT-WP started in the early eighties as a program with a too limited scope (focusing only on the technical aspects of maize production in Kaoma district), in the early nineties the program had become too wide, covering too many research themes and research zones.

> "Too often a research program is a train that rolls relatively heedlessly along. New work programs are often based on a hasty analysis of seasonal results, plus a lot of 'intuitive' knowledge. This process will never be entirely replaced by formal priority setting. However ... time for thorough synthesis and reflection needs to be built in from the beginning, as part and parcel of a research program. In planning FSR&D programs time should be explicitly reserved for such pauses. In extreme situations, taking time for such necessary syntheses can be even more important than continuation of the field program for another year!" (Vierstra & Ndiyoi 1994).

A temporary halt of field experimentation in order to make time available for analysis of already present material, has been proposed by me in several countries but always felt on deaf ears. Still I

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34. A further reduction of the size of the work program is necessary, also because at the end of 1995 all expatriate technical assistance personnel was withdrawn. This rather abrupt termination of technical assistance was due to the re-organization of the Dutch assistance to Western Province, which in turn was dependent on the re-organization of national and international support to the agricultural sector (ASIP = Agricultural Sector Investment Program). The uncertainties accompanying the introduction of ASIP, and the wish of the Zambian authorities and team members to phase out expatriate assistance, resulted in the withdrawal of all technical assistance personnel.

consider it legitimate to take such action, since quality -not quantity- lies at the heart of effective and relevant field experimentation. Complete analysis and reporting on results of experiments -i.e., high quality work- can produce insights that enrich our understanding of farmers' practices. Whereas I agree with Vierstra & Ndiyoi's assertion that formal priority setting will never completely replace intuitive operation, I am not at ease with the emphasis they (and virtually all other authors) put on formal methodologies in priority setting and other aspects of agricultural research. Later on I will argue that a combination of formal methodologies (which can make analyses more transparent) *and* enhancement of intuitive operation will shed more light on resource-poor farmers' problems (chapter 12).

High quality on-farm research work is also a first prerequisite to strengthen the links with on-station research. In order to gain credibility, the analysis and reporting on the results of experiments implemented by FSRTs must be of high standard. The trade-off between quantity and quality cannot be escaped: research quality inevitably deteriorates when too many research themes and research areas are involved. FSR practitioners better recognize the importance of "giving priority to quality of research over quantity" (Merrill-Sands et al. 1991). To put it somewhat provocatively: a professional attitude of agricultural scientists entails high quality work.

In FSRT-WP a considerable backlog in analysis of experiments existed. A complete and adequate analysis of on-farm experiments entails four distinct but complementary analyses: statistical, agronomic and economic analysis, and farmers' assessment (Van Leeuwen 1988). Since on-farm trials often -but not necessarily- have relative high coefficients of variation, a statistical analysis of the data is important for a correct interpretation of the outcomes. Without a statistical analysis a large experimental error -due to unknown sources of variation- makes it difficult to judge the reliability of differences between treatments. If differences between treatments are very large, a statistical analysis might be superfluous but such 'magic bullet' treatments are rather the exception than the rule. Smaller treatment differences, which are not easily visible with the naked eye in small experimental plots, might still be of interest to farmers. Before researchers undertake an agronomic and economic analysis, and organize a farmers' assessment, they should be reasonably sure about the factualness of the differences between treatments (CIMMYT 1988:21,60). In this respect statistical analyses (including within-site analyses and combined across-sites analyses, and across seasons analyses, when appropriate) are an important tool.

Box 8: The need for statistical analysis of on-farm experiments (Van Eijk 1995b).
In a Researcher-Managed Farmer-Implemented on-farm experiment, implemented in Kaoma district in the season 1994/95, the experimental variable was the level of fertilizer application in maize: two levels of basal dressing (100 and 150 kg/ha of D-compound) and two levels of top-dressing (150 and 200 kg/ha of urea)[35]. The experimental design in this 2^2 factorial was a Randomized Complete Block Design with 2 replications within each farm, planted on 10 farms (locations). The combined Analysis of Variance across 7 locations is presented in the next table (3 locations were omitted from the combined analysis because the coefficients of variation of these within-site analyses were close to or above the 20% level. The causes of the high values of the coefficients of variation were known and were not related to the experimental treatment).

The location effect was significant at the 0.14 level. The mean yield levels at the farms ranged from 4.3 to 6.4 tons/ha with an overall mean yield of 5.5 tons/ha, which is a high yield level[36]. The pooled replication effect was very significant, implying that the careful positioning of blocks in farmers' fields had been effective in reducing the experimental error. The coefficient of variation for the combined analysis across 7 farms was 10.4% which is not bad at all for on-farm experiments. This low coefficient of variation shows that reliable results can be obtained in on-farm experiments just by careful positioning of blocks and standardized harvesting procedures.

Since the main basal effect was significant at the 0.01 level, and no location x basal interaction effect could be determined, we have to conclude that on most farms the higher level of basal dressing yielded significantly more than the lower level. The main top dressing effect was non-significant (0.26 level) while the interaction location x top was very significant. This implies that no overall top dressing effect can be claimed: the effects of top dressing differed per farm[37]. Although one additional bag of top dressing gave on average 0.4 tons maize extra -the same yield increase as one additional bag of basal dressing- the significant location x top effect prohibits to jump to generalizing conclusions about top dressing application. In two locations out of seven the top dressing effect was significant with a yield increase of 1.5 and 1.7 tons/ha respectively. This shows how misleading it can be to base conclusions on mean yield figures across farmers without a proper statistical analysis. Unfortunately, the puzzling top dressing effect could not be explained by any of the field observations made in the course of the season. In a group assessment exercise with the trial farmers the only explanation offered for the inconsistent top dressing effect was localized rainfall patterns.

Since the main basal effect was significant, and no interactions location x basal and basal x top were observed, a partial budget analysis on the main basal effect was done[38]. The calculated Marginal Rate of Return (MRR) from the lower to the higher level of application was 41%. Since this MRR was lower than the minimum rate of return (set at 90%), it is unlikely that farmers would apply the additional bag of basal fertilizer. This shows the importance of an economic analysis with realistic farm-gate prices for fertilizer and maize: although one additional bag of basal fertilizer gave a statistically significant yield increase, the economic analysis indicated that the investment was not profitable. All this suggests that the lowest fertilizer application (100 kg/ha basal +150 kg/ha top) would be an option worthwhile of further investigation. Low levels of fertilizer application (with high responses per kg of fertilizer applied) are anyhow the reality in farmers' fields in these days of ever-increasing fertilizer prices.

The slightly significant location effect[39] and the very significant location x top effect are an indication of variability among farms. This variability resulted in interactions between the experimental treatment and farms.

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35. These levels of fertilizer application are so high because of the very poor soils in Western Province.

36. With regard to the high yield levels, we have to take into account that the experimental plots were small (harvesting area = 18 m^2), fresh hybrid seed was used, most experiments were well maintained, and that the rainfall distribution was quite favorable this season in Kaoma. In order to compensate for these factors, a yield adjustment factor of 25% was used in the partial budget analysis in the calculation of marginal rates of return.

37. In Van Eijk (1995b) more detailed information and a graphic representation can be found. With regard to the effect of basal dressing the graphs show that at 5 out of the 7 locations the extra basal dressing resulted in a higher yield, while at 2 locations the yields were more or less equal. With regard to the top dressing effect two locations displayed a negative effect (at 0.16 and 0.23 levels of significance), three a positive effect (at 0.02, 0.09 and 0.38 levels of significance), and in two locations hardly any effects were found.

38. The partial budget analysis is based on CIMMYT (1988). The statistical analysis of this experiment is based on Neeley et al. (1991).

39. The convention to call treatment effects very significant at the 0.01 level, significant at the 0.05 level, and non-significant above the 0.05 level should be relinquished for on-farm experimentation. A treatment effect at the 0.10 level of significance (or above) can be quite acceptable depending on the nature of the experimental

The combined statistical analysis across farms revealed these interactions, and prevented undue generalizations in recommendations to farmers and facilitated priority setting for future experimentation.

ANOVA-combined analysis [40]

Source of variation	Degrees of freedom	F value	Probability
Location	6	2.35	0.144
Pooled replication	7	5.65	0.000
Basal dressing	1	11.30	0.015
Location x Basal	6	0.60	
Top dressing	1	1.53	0.261
Location x Top	6	4.33	0.005
Basal x Top	1	0.22	
Location x Basal x Top	6	1.99	0.11
Error	21		
Total	55		

Main effects of basal and top dressing (mean yields in tons/ha)

Main basal effect	Main top effect
100 kg/ha: 5.3	150 kg/ha: 5.3
150 kg/ha: 5.7	200 kg/ha: 5.7

Since resource-poor farmers are the main target group of FSR programs, and since these farmers usually adopt innovations in a stepwise fashion, it follows that the various levels of experimental variables in on-farm trials should represent small steps. This, in turn, implies that in most cases only relatively small differences in yield between treatments will be found. Since variability among farms normally is high (this is in fact the reason that we started on-farm experiments), and since interactions between farms and experimental variables do occur, the calculation of means of treatments across

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treatment and the risk involved for the farmer in applying this treatment. Farmers take decisions in less certain situations (Collinson 1987a).

40. In the analysis the statistical program MSTAT was used (MSTAT-C, Version 2.10, Distribution June 1991). In combined analyses the MSTAT function Factor calculates all F-values by using the final MS (Error) in the denominator. This anomaly -the treatment effect should be tested against the treatment x location effect, not against the final Error term- can be corrected by using the Custom Design option. Therefore, the option ‘Custom Design’ under the function FACTOR (Number 35) was used to calculate the combined ANOVA table. For a correct analysis of on-farm trials across locations one has to use the so-called K-values in this Custom Design option. See for details: Van Eijk (1995c).

farms is not sufficient. Appropriate extension messages, which acknowledge the time- and location-specific character of farming in East Africa, cannot be developed without thorough analysis of on-farm experiments.

In FSRT-WP statistical analyses, and economic analyses, were often postponed (and subsequently skipped) because of the overloaded work program. In addition to the fact that working with means of treatments can result in misleading conclusions, it also will not easily convince on-station researchers that FSRT-WP produces high quality research work. Before collaboration can develop, FSR practitioners have to show other researchers that they have something to gain from FSR work.

In addition to the overloaded work program, another reason for skipping statistical analyses may have been the recent emphasis on farmers' assessment. The tendency developed to consider farmers' assessment *the* ultimate criterion for decision making. Although large scale adoption (and adaptation) by farmers certainly is an important criterion for successful research work[41], the preceding farmers' assessment of experimental results frequently is a relatively subjective and unstructured exercise (one reason being that farmers' assessment is still a new methodology). When treatment differences are relatively small, also farmers can have difficulty in recognizing these differences. Relying on farmers' assessment alone can then be a tricky way to come to sound recommendations. Moreover, there is no reason whatsoever to skip one of the four analyses since they are perfectly compatible. Although a statistical analysis will not impress farmers, colleague scientists will demand scientific rigor if you want to collaborate with them. And, in the end, FSR practitioners cannot operate without support from on-station researchers who have to generate at least a part of the new technologies to be tested on farm.

4.4.4 *Soil fertility*

Maize on-station trials in Zambia yield 7-8 tons/ha, while the yield levels of small-scale farmers remain stagnant around 1.5-2 tons/ha. According to Reddy et al. (1989) a new dimension was added to the national variety trials by testing all varieties under low (smallholders' management) and high (existing extension recommendations) management levels. Since the 1989-1990 season subsidies on inputs, and on marketing and transport of produce, have been phased out, resulting in sharp increases in fertilizer prices. This made especially the issue of fertilizer use efficiency important. Highly significant differences in response of maize varieties to fertilizer applications were found. Also the sunflower commodity program reduced fertilizer levels by fully one-half in some of their on-station trials for screening varieties, when information on smallholders' management conditions became available (Merrill-Sands & McAllister 1988).

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41. One can argue that scientists should not accept large scale adoption as a single criterion for successful research work. Even if many farmers adopt a certain practice, it still can be a faulty technology (e.g., from the long term perspective of maintenance of soil fertility). In science -unlike in politics- a majority of votes does not apply. Scientific evidence is required. In the scientific quest for understanding, however, one specific, uni-dimensional 'rationalization' often prevails. The dominant positivist paradigm denies the existence of multiple rationalities in a multi-facetted development process. The positivist paradigm easily denies the 'art, craft and science' (Engel 1995:13) of indigenous agronomy. In the process of subjecting indigenous knowledge to scientific scrutiny, diversity and complexity are reduced to manageable proportions, and over-all system performance (synergy) might disappear from sight. A fragmented view is the result (see also section 5.1: operational problem number 5).

Variety screening under high as well as low management levels can be justified when a considerable part of the farmer population uses high levels of external inputs. In East Africa, however, the percentage of farmers engaged in high-external-input agriculture is very small. One can wonder whether this small group -having relatively easy access to the research and extension systems and having considerable political power- should receive such a disproportionate part of the research cake. The lure of 'modern' farming can easily result in an unbalanced situation (see the Mozambique and Tanzania cases).

Box 9: Plant breeders and FSR agronomists

Unfortunately, an example from Western Province suggests that the research policy as described by Reddy et al. (1989) is not yet common practice in Zambia. In the season 1994/95 a maize breeder planted an on-station experiment for the testing of drought tolerant maize varieties in Senanga-West. The research protocol of this experiment prescribed the following non-experimental factors: 400 kg/ha basal dressing and 400 kg/ha top dressing, the application of a pre-emergence herbicide, and an insecticide. Farmers in Senanga-West do not apply fertilizer on maize nor do they use herbicides and insecticides. They manure (a part of) their cereal fields once in every three years through a shifting-the-kraal system (30 tons/ha of dry matter manure, which gives about 300 kg/ha N every three years). This results in an average annual N application of considerably less than 100 kg/ha since a large part of the N gets lost through volatilization. The 400/400 fertilizer application, however, gives 224 kg/ha N per year. Despite the arguments brought forward by FSRT-WP, the maize breeder insisted that the variety screening had to be done under optimum crop husbandry conditions. In his view the FSRT-WP agronomists are, after release of the varieties, responsible for testing the selected varieties under farmers' conditions. It is obvious that the chances that the selected varieties will perform better than the local varieties in farmers' fields are small, since right from the beginning the selection procedure has been ill-focused. Besides the unrealistic non-experimental factors in this experiment, another disturbing factor is the relationship between soil fertility level and drought tolerance. Under high soil fertility conditions maize plants will develop shallow root systems, making the crop susceptible to dry weather conditions. It is sad that twenty years after the introduction of the FSR philosophy in East Africa many plant breeders are still screening their material under conditions which are not relevant to the large majority of the farming population, i.e., the resource-poor farmers[42].

With respect to breeding and agronomy work it is important that local authorities and donor agencies have realistic expectations with regard to the contributions that agricultural research can make to rural development in Western Province. The history of agricultural development in developing countries since the early sixties indicates that average yield levels per unit of area -over long periods of time and over large groups of farmers- only increase with 1-2 per cent per year[43]. For example, increases in the yield level of rice -in Western Province grown on sandy soils and under uncontrolled water management conditions- will probably not surpass an average annual increase of 1 per cent. The high yield levels at the end of contract periods -as estimated in project proposals of consultancy firms- are not realistic.

In Box 10 an example is given of the discrepancy between research and extension recommendations and actual farmers' practice.

42. In all East-African countries where I worked I had similar disagreements on research policy with plant breeders, who generally are held in high esteem in East Africa. One can wonder why plant breeding gained such a prestige? One reason why national as well as international research institutes focus so much on breeding is that new varieties are relatively easy to develop and introduce. As Blackie (1994) indicated in section 4.3.3, high quality crop husbandry research is more complicated. Good agronomy work requires insight in resource-poor farmers' conditions, and, thus, field experience and frequent contact with farmers.

43. This percentage is based on data in Paulino (1987), Beets (1990) and Andrews & Bramel-Cox (1993).

Box 10: A farmers' practice: mixed application of basal and top dressing in maize.
In the season 1994/95 a Researcher-Managed Farmer-Implemented on-farm experiment in Kaoma gave the mean yield levels (6 farms) as presented in the next table. Two fertilizer applications differing in quantity as well as timing of application were tested (Van Eijk 1995d;e). The 150/150 application was the FSRT-WP recommendation for the season 1994/95, while the 100/100 application is a farmers' practice. The difference in yield level was significant at the 0.05 level. Farmers give two reasons for mixed application: 1) fertilizers do not arrive in time so that one has no choice but to mix the basal and top, and to apply this mixture at a late stage in the crop cycle in one go; and 2) the number of bags of basal is too small to put it on a large field, by mixing the basal and top a larger quantity is available for application.

Fertilizer application	Yield in tons/ha
150/150 kg/ha: separate application of basal and top, both applied in time.	5.5
100/100 kg/ha: mixed application of basal and top, relatively late applied.	4.4

At first thought one would say that delayed mixed application of basal and top should not be recommended, since two basic rules of fertilizer application are violated: basal and top fertilizers serve different purposes and fertilizers should preferably be applied at optimum moments in the crop cycle. However, it is also true that it can be wise policy to spread expensive fertilizer thinly. The distribution of a small quantity of fertilizer over a large area makes sense from the point of view of response to an expensive input. The initial steep part of fertilizer response curves supports the low application rate per unit area in mixed application. The 150/150 application gave 5500/300 = 18.3 kg maize/kg fertilizer, while the mixed application gave 4400/200 = 22 kg maize/kg fertilizer. This implies a higher return to a limiting production factor (cash to buy fertilizer). For resource-poor farmers it makes sense to stick to the straight segment of the response curve, where the returns in kg of maize per kg of fertilizer are highest[44].

Maize production in Western Province is a kind of 'status' enterprise. The larger the area of maize one grows, the larger one's prestige in the community. This contributes to the practice of mixed application over a large area. The cultivation of a large maize area requires more labor for land preparation, planting, weeding and harvesting than a more intensified system (the mixed application requires however only one fertilizer application, while the FSRT-WP recommendation requires two applications). The mixed application practice probably gives less returns to labor than a more intensified system. But with cash being the most limiting production factor in Kaoma, and land and labor being relatively less limiting, mixed application does make sense.

In the end the farmer faces the task to decide on the most optimum mix of investments in cash, labor and land. His/her choice can be influenced by various considerations: status factors; risk avoidance in the sense of having a large area of maize under staggered planting; labor spreading through staggered planting; waiting with fertilizer application until the young crop and the season look promising; and fertilizer application immediately after weeding which can be delayed due to peak labor periods.

Already in the early eighties FSRT-WP reported that in Kaoma district farmers applied 'suboptimal' levels of fertilizer in their maize fields ('suboptimal' meaning below the national fertilizer recommendations) (Vierstra & Ndiyoi 1994). On-farm experiments in the period 1985-1987 confirmed that some maize varieties responded well to so-called 'improper' methods and rates of fertilizer application. And on-station experiments implemented in Kaoma in the eighties indicated that the fertilizer levels 100/100 and 200/200 (separate application of basal and top) did not result in significantly different maize yields. One can wonder then why the mixed application practice of farmers (100/100) did not continue to receive more attention from researchers?[45].

44. Sanchez (1994) pleads for a new paradigm in tropical soil fertility research. Yield response curves should be interpreted in a different way. Instead of using marginal analysis of quadratic response curves, the yield response per unit cost of applied nutrient must be maximized. A focus on the steep part of the yield response curve is recommended. With this approach nutrient recommendations can be reduced with only a slight decrease in yield.

45. Waterworth & Muwamba (1989) report that in Central Province in Zambia labor shortages resulted in delayed weeding and subsequently delayed top dressing in maize. On-farm trials at the end of the eighties confirmed that combined (basal and top) fertilizer application together with early weeding (at 20 cm height of the maize crop) resulted in higher yields and reduced labor inputs at peak periods. Unfortunately, I only found this information

The national blanket recommendation of 200/200, which had already been lowered to 100/200 by FSRT-WP in the season 1992/93, can probably be lowered even further. This case of the practice of mixed application shows that easy, straightforward solutions to the complicated problems of resource-poor farmers do not exist. Farmers, extensionists and researchers have to adapt or 'fine-tune' general recommendations to the location-specific and dynamic situation of individual farm-households. Thus, under resource-poor farmers' conditions "the question is no longer what is the optimum application rate but how little fertilizer is enough" (Sanchez 1994).

The fine-tuning of recommendations by FSRT-WP resulted in so-called 'conditional' recommendations, which are suboptimal and conditional on natural, economic and/or seasonal circumstances. Since conditional recommendations do not conform to 'technical' ideals, they often conflict with Transfer of Technology (TOT) based extension approaches (Low et al. 1991). Instead of teaching 'recipes' to farmers, extensionists must try to understand the reasoning behind the inevitable management compromises of farmers (Box 10). This, however, requires a different kind of training and new skills. The prevailing teacher-pupil relationship between extensionists and farmers needs modification: i.e., a change toward a more collaborative attitude is required.

Such a change in attitude is also required with on-station scientists. For example, in on-station research which focuses on the determination of the minimum quantities of nutrients required for sustainable crop production, a differentiation between experimental and non-experimental factors is necessary. This implies a change in research protocols. Instead of applying 'blanket applications' of fertilizer in order to make sure that no nutrients, other than the one being investigated, are limiting, one is now interested in the minimum amount of external nutrients to apply. For that reason the levels of other soil properties (i.e., the non-experimental factors) "remain as they are or be ameliorated by organic input additions, nitrogen fixation and maximum residue recycling" (Sanchez 1994)[46]. The shift from a single-minded focus on fertilizers towards 'integrated nutrient management' (Smaling 1993) demands a change in attitude and behavior, and leads to new research and extension approaches (section 3.1).

Lipton & Longhurst (1989) warn for the 'soil mining' effect of continuous cultivation of modern high yielding varieties under low fertilizer applications (section 4.3.3). On the sandy and relatively acid soils of Kaoma district in Western Province continuous application of nitrogen fertilizers on maize fields resulted in lowering yield levels, probably due to increasing acidity. With the ecological sustainability issue in mind, one can wonder how long the practice of continuous maize cultivation without crop rotation can continue. At present farmers can still shift to another field, but

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when I was back in The Netherlands. Apparently nobody in FSRT-WP nor the national FSR coordination unit in Lusaka knew about this research implemented in Central Province, or, at least, did not bother to inform us. This absence of institutional memory in projects with rapidly shifting national and expatriate staff members is a problem. Although the on-rolling train of research activities did not easily allow for periods of literature survey, I tried to review (most) literature on the topic of integrated soil fertility management in Western Province (Van Eijk 1995f). From this review it appeared that the mixed application practice had been included in some experiments in the early eighties. Unfortunately, this research did not result in straightforward conclusions, and for one reason or another it was not continued (ibid.:17-19). Also Mutsaers (1994) recommends that FSRT-WP makes optimum use of already existing knowledge in Zambia and elsewhere.

46. The Sorghum and Millet Commodity Program at Mongu Regional Research Station manured the fields for variety screening through the shifting-the-kraal system. On top of that, the fields received a blanket application of fertilizer to level out any differences in soil fertility. Although the manuring system is farmers' practice, the additional fertilizer application makes the variety screening less relevant to resource-poor farmers' conditions. The potential danger is that one selects varieties which perform well under higher soil fertility conditions than most farmers can realize.

with the increasing population (also caused by migration into Kaoma district) this sooner or later will come to an end. The problem is, however, that farmers who have a hard time to sustain the family on a season to season basis, cannot be very concerned about maintenance of the resource base for future generations (Budelman & Van der Pol 1992). For resource-poor farmers accessibility to credit and markets are more pressing problems than fertility decline “and they are right” (Sanchez 1994). Also FSRT-WP has been confronted by this dilemma. On the one hand, the integrated soil fertility management program of FSRT-WP implied a shift in emphasis, namely “from problems raised by farmers, to problems farmers face but do not yet recognize” (Vierstra & Ndiyoi 1994). On the other hand, land scarcity is not a problem yet in Kaoma which makes that farmers are less interested in a research program that focuses not only on fertilizer, but also on crop rotation, improved fallows, agro-forestry and manure. A program, moreover, which is unlikely to produce quick results.

In order not to lose credibility with farmers (and donor agencies, policymakers and on-station researchers) the long-term research on integrated soil fertility management preferably should be balanced with research on short-term alternatives. Unfortunately, also promising short-term alternatives are not easily at hand in Western Province (ibid.). While in Kaoma district with its relatively good soils fertilizer application is at least a short-term option, fertilizer application on the “almost impossibly infertile” Kalahari sands on the uplands of Western Province (occupying more than 50% of the province) will probably remain an economically marginal activity (Budelman & Van der Pol 1992). One cannot expect much from agricultural research aimed at sustainable use of these Kalahari sands[47].

Unfortunately, most technological improvements proposed by research require from farmers more labor. Therefore, practices such as improved fallows with fodder legumes, agro-forestry systems and manure production do not appeal to farmers who are still little concerned about the fertility issue. Research and extension efforts aimed at introducing such practices “often are basically wasted efforts” (Sichinga & Stoop 1993). In the context of still abundant land and relative shortages of (female) labor and capital, interventions in Kaoma district which aim at animal-power based technology (emphasizing ploughing, weeding and transport) and at increased efficiency of fertilizer use (leading to lower application rates) are more logical.

FSRT-WP did research on agro-forestry and manuring systems, but the problem is that the necessarily pluri-annual trials are relatively difficult to plan and implement, and chances on finding ‘breakthroughs’ in the marginal environment of Western Province are small. Most experiments on these topics did not result in clear-cut conclusions (Van Eijk 1995e;1995f). It is evident that research on integrated soil fertility management requires long-term financial support, and ideally should be initiated and coordinated by thematic research teams. FSRT-WP had the tendency to become a ‘jack of all trades’ which did not always result in high quality and productive research.

> “It must be realized that FSRT-WP faces an almost impossible task. It works in a vast, thinly populated province with a fragile and marginal natural environment and a weak infrastructure. Yet, there is a huge diversity in agricultural systems each with a different set of constraints. Consequently the demands on

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47. Budelman & Van der Pol (1992) argue that in Western Province only multiple goal land use -combining tree crops with natural forest and wildlife exploitation, and possibly tourism- constitutes a solution. A suitable tree crop could be cashew. The natural forest and current wildlife population, however, are so poor that I wonder whether these options are realistic. Tourism in the remote Western Province with its lack of infrastructure also seems an unlikely alternative, keeping in the mind the fierce competition of already established tourist attractions in East Africa.

> research are also large and diverse. At the same time the back-up support by national thematic and commodity research is exceedingly weak, so that FSRT-WP must operate in relative isolation. In response the FSRT-WP program has become very comprehensive, but ... also overloaded in terms of number of activities as well as topics studied. ... This results, among other things, in problems with the analyses of the many data collected, their interpretation and reporting" (Sichinga & Stoop 1993).

4.4.5 *Interdisciplinarity within FSRT-WP*

In the years 1994 and 1995 FSRT-WP was a multidisciplinary team with all relevant disciplines represented. Nevertheless, the interdisciplinary collaboration was rather weak. According to Vierstra & Ndiyoi (1994) all provincial FSRTs in Zambia suffer from problems of interdisciplinarity. Management of human resources is an important tool in FSR to stimulate interdisciplinary collaboration, but "personal relationships and many other psychological factors play a crucial (if not dominant) role with respect to the way the disciplines work together" (ibid.). Vierstra & Ndiyoi (1994) argue that interdisciplinarity within a team is not self-evident, but must be organized. FSRT-WP used the elaboration of research protocols and the writing of state of the art papers as tools in the development of interdisciplinarity. At the same time, these tools facilitated priority setting and made it more transparent. Also special research activities, such as for example informal surveys, were organized to create opportunities for interdisciplinary work, i.e., to establish "a real interdisciplinary atmosphere" (ibid.). The household monitoring program also provided opportunities for interdisciplinary collaboration. Unfortunately, more data were collected than effectively used in interdisciplinary undertakings, although *ad-hoc* and partial use of data occurred.

Interdisciplinary collaboration in multidisciplinary teams requires also that researchers regularly report on their work, and read reports of colleagues carefully and give feedback. Without an explicit allocation of time to these issues, interdisciplinarity remains superficial. Annual reports tend to become a collection of disciplinary papers stapled together: the whole is not more than the sum of the parts. Some team members had difficulties in handling interdisciplinary feedback: comments were seen as an intrusion into their field of specialization.

A structural area of tension was the collaboration of national and expatriate researchers. The history of FSRT-WP had its conflict-ridden periods (Vierstra & Ndiyoi 1994). One important cause of this tension was that expatriate researchers were more project oriented, they aimed at quick results in Western Province within the project period, while national researchers were more program oriented and gave priority to matters at the national level (ibid.). Expatriate team members primarily wanted to develop relevant technologies for the target group in Western Province, while national team members wanted to permeate the whole national agricultural research system with a farming systems perspective. A practical consequence was that national FSRT-WP staff eagerly responded to requests from Lusaka for assistance, frequently resulting in "a suboptimal availability of Zambian team members at provincial level" (ibid.)[48]. Also Mutsaers (1994:49) refers to this dual objective which can lead to ambiguity concerning the function of FSR projects.

4.4.6 *Linkages*

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48. A more cynical interpretation of the eagerness to respond to requests for assistance from the national level is that the high DSAs in Lusaka were a welcome addition to the low salaries (in my judgement an understandable reaction to a lousy financial situation).

While research is the primary mandate of FSRTs, the impact or multiplier effect of the research work done by FSRTs can be increased through engagement in developmental activities. Although FSRT-WP certainly must strengthen its linkages with extension, the provincial planning unit, and other stakeholders in the rural development process, the appropriate division of FSRT-WP's limited resources between research and developmental activities is a difficult issue (Norman & Mwenya 1993:viii). The provincial FSRTs and the national FSR coordination unit in Lusaka occupy 20 per cent of the human resources in the Zambian agricultural research system (Merrill-Sands et al. 1991). This implies that the larger share of the research budget is spent on commodity- and discipline-oriented research, which, unfortunately, is not always relevant to resource-poor farmers. Therefore, the feedback role from FSRTs to on-station research is essential: when FSR cannot influence the research agenda of on-station research, one of its main functions has not been realized. The strengthening of linkages with on-station research deserves the highest priority (Norman & Mwenya 1993)[49].

With regard to the integration of on-farm and on-station research a nine-country case study of ISNAR, including Zambia's FSRTs, came to some important observations, and merits a full-length quotation (Box 11):

Box 11: Some remarks from the ISNAR nine-country case study.

"The very factors which make on-farm and experiment station research complementary and interdependent create the potential for conflict. ... differences in methods, experimental designs, types of data collected and the criteria for evaluating results can provoke fundamental disagreements about research priorities and what constitutes good science. Two common areas of controversy are the higher coefficients of variation and higher rates of trial loss typical of on-farm research. ... If managed effectively, such differences can lead to constructive debate which improves the quality and relevance of both on-farm and on-station research. ... Too often, however, the debate simply degenerates into unproductive infighting. ... Power struggles easily erupt when either feedback from on-farm research or technical support from experiment station research is allowed to become supervisory, rather than advisory. ... The most common misconception was that on-farm research is simply a testing and demonstration activity, not a legitimate research activity. .. ..[research] managers have to ensure the scientific credibility of on-farm research. ... This involves two basic responsibilities. Managers must first ensure the quality of on-farm research by assigning capable researchers and providing strong scientific leadership. Secondly, they must ensure that experiment station researchers accept on-farm research as a viable research activity and clients' demands as a legitimate input into research planning and priority setting" (Merrill-Sands et al. 1991).

It is clear from Box 11 that a constructive debate between FSR practitioners and on-station researchers is not easy to organize. The inherent tension between the two groups of scientists (FSR developed as a response to the ineffectiveness of most conventional research) cannot be easily circumvented. As indicated in section 4.4.3 and in Box 11 a first prerequisite to strengthen the links with on-station research is high quality on-farm research: FSR must have scientific credibility. Credibility will develop when farmers adopt recommended technologies. Farmers adopt (and adapt) new technologies when these fit their circumstances. This implies accepting exogenous factors, which farmers and FSR practitioners cannot change in the short term, as 'given' and adapt the research program accordingly. This involves: 1) differentiation between experimental and non-experimental factors in on-station and on-farm experiments; 2) realistic levels for both these factors; and 3) staying alert and flexible in order to adjust the factors to the latest developments and trends in the

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49. Various authors (a.o., Gibbon 1994a;b) mention the Zambian FSRTs as a successful example of the feedback role to on-station research. These authors refer to Kean & Singogo (1988) for this conclusion. Unfortunately, my (limited) experience in Western Province does not allow for such a positive conclusion.

wider environment. When agricultural scientists would adhere to these components of a professional attitude, then on-farm and on-station research would become more effective. This requires scientific leadership in agricultural research. A scientific leadership, moreover, which is not overshadowed by demands of administration and coordination (Bingen & Poats 1990).

FSRT-WP established three platforms where the various stakeholders in the rural development process (including on-station researchers) could participate in research priority setting: the annual FSRT national meeting, the Region II meeting[50], and the FSRT-WP steering committee meeting at the provincial level. Unfortunately, these official meetings have had little impact (Vierstra & Ndiyoi 1994). Furthermore, FSRT-WP participated in meetings with the Provincial Planning Unit, Department of Agriculture, extension, and other provincial development projects.

In general on-station researchers were not receptive to feedback from FSRT-WP. They did not tend to integrate FSRT-generated priorities in their research programs, and they saw FSRT-WP more as a 'service-unit' of their own programs than as an 'autonomous systems research team' (Vierstra & Ndiyoi 1994). An example is the continuing focus of maize breeders on hybrids rather than open-pollinated varieties. The collaboration with commodity programs based at Mongu Regional Research Station was difficult, because of the ill-functioning of these programs. From the three commodity programs two were, more or less, existing on paper only. The (proposed) integration of commodity programs and FSRTs will not change this situation. The lack of means with commodity programs, and the envy of the privileged position of some donor-funded FSRTs, hampered collaboration. This will continue when donor agencies are not willing to invest more in commodity programs. In the prevailing situation in Western Province -limited presence of discipline- and commodity-oriented programs at the provincial research station, and little interest of national research programs in the remote province- FSRT-WP had no choice but to implement quite some on-station research.

One might argue that, for example, timely and adequate supply of fertilizer would have more impact on agricultural production than the research program of FSRT-WP (Vierstra & Ndiyoi 1994). Although FSRT-WP tried to strengthen links with input suppliers, the institutional barriers between input suppliers and researchers proved too strong to come to a constructive debate about improved input supply and new research priorities. Interest in collaboration will develop when the various actors understand and acknowledge the existence of a mutual complementarity, and thus see possibilities for synergetic effects of interaction. The prevailing trend in Western Province to establish more and more coordination mechanisms resulted hitherto only in lip service to collaboration; in actual practice hardly anything happened after the numerous meetings, workshops and conferences[51]. In my view commitment to the job and the ensuing interest in collaboration will (more or less) automatically result in new linkages and organizational set-ups: the most appropriate structures will spontaneously emerge in the course of the process of collaboration. It is wishful thinking to assume that collaboration can be 'forced upon' people through the set up of new organizational structures. The numerous individuals who participate in the rural development process will not spontaneously change their attitudes and behaviors because of new bureaucratic structures. To my mind, national governments and donor agencies spend far too much time on re-structuring organizations, which, in the end, is often 'symptom fighting'. Real causes of the disappointing

50. Region II is one of the three agro-ecological zones in Zambia. Western Province is mainly located within Region II.

51. A senior researcher in Mongu once remarked that attending all meetings at the provincial and national level for which one received an invitation, would be a full time occupation.

performances of research and extension systems (and other organizations) are not dealt with. Instead of fleeing into bureaucratic responses, a down-to-earth approach to day-to-day problems is needed.

Two large problems in the day-to-day implementation of agricultural research in Western Province are: 1) The low salaries of national scientists and the resulting motivational problems; and 2) the enhancement of the quality and relevance of research work (on-station and on-farm). It is obvious that these two problems are interrelated. As discussed earlier, topping up of local salaries by donor agencies -linked to regular performance evaluation- is a way to tackle these two problems simultaneously. When these problems are solved, the credibility of agricultural research in the eyes of other stakeholders in the rural development process will increase. As a Zambian colleague once remarked: ‘we work as we are paid’. As long as donor agencies consider the low salaries as a kind of limiting condition that is the sole responsibility of local authorities, little will change. In my view re-organizations of agricultural research will not have much impact unless first these basic problems at the heart of the agricultural research system are solved.

Undoubtedly, a reciprocity exists between the attitudes and behaviors of individuals and the structures which they form (Diagram 5: chapter 3), but since individuals are the building blocks of any structure, it follows that the primacy lays with individuals. The motivation and performance of individual scientists must receive more attention if the local authorities and donor agencies want to establish an efficient and effective agricultural research system. The current emphasis on merely cosmetic adjustments in structures is not going to be fruitful without due attention to the underlying causes of the crisis. Instead of emphasizing formal linkages in bureaucratic structures, informal linkages based on individual commitment require more attention. Informal linkages -almost by definition- develop between individuals who share a common interest in a particular topic, and who are really interested in collaboration. Formal linkages, on the other hand, often exist on paper only, and can become an alibi for lack of integration (‘we *are* attending all the meetings and workshops, what can we do more?’). Also Vierstra & Ndiyoi (1994) remark that FSRT-WP staff members were busy with (too) many meetings[52].

In 1996 the Agricultural Sector Investment Program (ASIP) was introduced, a donor supported investment program which resulted in a new position for FSRT-WP. The idea is that FSRT-WP implements research activities on a contract basis for other organizations such as, for example, District councils[53]. Also in 1988 FSRT-WP agreed to provide ‘service research’ on the priority themes and problems of other organizations. Service research died a gentle death one year after its initiation. FSRT-WP’s partners were not really committed to the beforehand agreed upon modalities of collaboration, and follow-up on results of research had mostly been lacking (Vierstra & Ndiyoi 1994). The underlying idea in 1996 was that priority setting for research at district level would result in more relevant research for resource-poor farmers, which, in my view, probably is wishful thinking. The professional capacity to implement such priority setting exercises is lacking at district level, and more importantly, a decentralization of decision-making power and an accompanying build-up of countervailing power with the target group do not take place (yet). Moreover, motivational problems caused by low salaries will have to be solved at district level as well.

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52. Meetings, moreover, in which a part of the participants had not done the preparatory work: reports had not been written and documents to be discussed had not been read.

53. When I left Zambia at the end of 1995 the modalities of ASIP were not yet clear. Only some very general policy statements reached Western Province. The practical consequences for FSRT-WP were not known.

With regard to research-extension linkages FSRT-WP established a Research-Extension Liaison Officer (RELO) post to fill the void created by an ineffective extension system[54]. The presence of a RELO, however, became a kind of alibi for provincial extension officers to shift most responsibility for research-extension linkages towards FSRT-WP. Instead of a two-way flow of information, it became a one-sided task of the RELO. An example is the production of (pre-) extension leaflets by FSRT-WP. The drawback was that this initiative stimulated the extension department to sit back and wait for others to do their job. Especially in donor-funded projects, the choice between promotion of ineffectiveness in other departments and ‘getting things moving’ is a dilemma. In my view FSRT-WP can assist others in the implementation of their duties, but the team should not take the leading role in activities which cannot be classified as agricultural research. The holistic nature of FSR easily results in counterproductive strategies. In the end, the quality of research work suffers and other stakeholders continue to refrain from implementing their duties.

At district level the discussion of results of on-farm experiments in district extension seminars was successful. Enthusiastic reactions from extension staff indicate that such an approach -present hard data based on on-farm experiments in their working area- can provoke a lively discussion among participants in extension seminars. This underlines the importance of concrete material in seminars, meetings and workshops.

All in all, it is clear that the fostering of effective linkages in the rural development process is easier said than done. Most actors have formal and informal objectives: the hidden agendas of the multitude of actors can complicate collaboration (section 1.4). Who has the capacity and power to coordinate the effective involvement of all actors? We will return to this complex issue later on. Meanwhile one can wonder whether the long-term donor support to the FSR team in the end really made a difference to the majority of the target group of resource-poor farmers in Western Province. Other factors, such as an adequate infrastructure and a reliable input supply and marketing system, are more determining in improving the well-being of resource-poor farmers (section 4.3.3). The most outstanding contribution of FSRT-WP to the national and provincial agricultural research and extension system might have been the training of staff members at all levels in the hierarchy: from formal M.Sc. training of scientists to informal, on-the-job training of farmers, field technicians and extensionists.

54. See also footnote number 3 of chapter 2.

4.4.7 *Conclusion*

The last few seasons FSRT-WP worked with Farmer Research Groups. Farmer participation through these FRGs was more consultative than collaborative. The working with FRGs proved to be time consuming. Trust had to develop between farmers and researchers, and some degree of ‘cooperative conflict’ was inevitable in this relationship. A more collaborative mode of participation requires a transformation of the still quite common teacher-pupil attitude with extensionists and researchers. In order to redress imbalances based on gender, the will and skill of the various actors in the rural development process must be enhanced. Besides training, empathy with the target group is important. A combination of the upper and lower routes in Diagram 5 (chapter 3) offers most hope of a change in attitude toward (female) resource-poor farmers. While training focuses on the upper route, empathy most likely comes about through the lower route.

The over-ambitious work program of FSRT-WP resulted in incomplete analyses. Complete and thorough analyses including statistical assessments -i.e., high quality research work- are part and parcel of a professional attitude.

An example of keen farmers’ behavior -although not yet recognized as such by many scientists and extensionists- is the mixed application of basal and top dressing. Under resource-poor farmers’ conditions a focus on the steep part of the yield response curve makes sense. The conditional recommendations issued by FSRT-WP demand for a change in attitude with extensionists and on-station scientists. It is unfortunate that 20 years after the introduction of the FSR philosophy in East Africa many plant breeders are still screening their material under conditions which are not relevant to resource-poor farmers. FSR practitioners are confronted by the dilemma to allocate scarce resources between long-term research on integrated soil fertility management and short-term research on more promising technologies: between unpopular technologies which demand additional labor of farmers and ‘quick fix’ solutions such as high yielding -but soil mining- varieties: between ecological sustainability and short-term economic gain for resource-poor farmers.

Interdisciplinary collaboration in the multidisciplinary FSRT-WP team -with all relevant disciplines represented and with ample (donor) funding and equipment- was rather weak. Notwithstanding all kinds of tools employed by FSRT-WP to create opportunities for interdisciplinary work, personal relationships continued to play a crucial role.

The linkage between FSRT-WP and on-station research was problematic. The inherent tension between the two groups of scientists hampered FSRT-WP’s feedback function to on-station research. FSR, first of all, requires scientific credibility, i.e., high quality research work is needed. Motivational problems, partly caused by low salaries, frustrated this build-up of credibility. Official, formal linkage mechanisms -established to improve the performance of the various actors in the rural development process- were not effective. Informal linkages based on individual commitment deserve more emphasis and support. The coordination of the multitude of actors remains also problematic. The countervailing power of the resource-poor farmers in Western Province is not adequate to ‘enforce’ demand-led research and extension organizations, nor to create synergy in the ‘mix’ needed for efficient agricultural development (section 4.3.3).

4.5 Conclusion

A number of important issues emerge from my work experiences. Although these issues did not occur equally prominently in each work experience, they feature as important operational problems in the implementation of FSR activities in East Africa. The interpretation of my work experiences and the ensuing emergence of operational problems are based on the analytical perspective as presented in chapter 3 (Diagram 5). The operational problems, some of which are interrelated and partially overlap, are:

- lack of a client-oriented attitude: expressed in low political commitment to resource-poor farmers, indifference to actual farmers' conditions, and a teacher-pupil attitude with researchers and extensionists.
- lack of a farming systems perspective. In combination the lack of a client-oriented attitude and the lack of a farming systems perspective result in research which is not relevant to resource-poor farmers.
- lack of countervailing power with resource-poor farmers.
- lack of high quality research: inadequate design, implementation and analysis of on-station and on-farm experiments.
- low salaries: resulting in motivational problems.
- lack of interdisciplinary collaboration: within FSR teams, and within groups of commodity- and discipline-oriented scientists.
- inadequate linkages: between FSR and on-station research, and among the other actors in the rural development process. The coordination of the multitude of actors is problematic.
- insufficient understanding and/or recognition of the multi-dimensional development process: focus on agro-technical factors prevails.
- lack of field experience: field experience is a precondition to the development of relevant and high quality research.
- non-implementation of recommendations made by evaluation missions: donor agencies do not effectively follow up recommendations.
- the relationships between farmers and planners/scientists/extensionists, and between expatriate technical assistance personnel and national scientists, are often characterized by 'cooperative conflict': actors frequently have hidden agendas.

One of the most important conclusions is that the commitment of agricultural researchers to the target group of resource-poor farmers must be visible in *relevant* and *high quality* research work, i.e., a professional attitude is required. In the Mozambican, Tanzanian and Zambian cases inappropriate experimental designs and poor statistical analyses of on-station and on-farm experiments contributed to poor quality research work. A complete analysis of experiments - including a statistical analysis- would result in better understanding of farmers' practices, prevent undue generalizations in recommendations to farmers, facilitate priority setting for future experimentation, and enhance credibility with on-station researchers. The tendency among a part of the FSR practitioners to rely on mean yield figures across farmers, denies the spatio-temporal variability in East African farming systems. This neglect of variability between and within farms is a denial of the fact that variability was a main reason for the emergence of on-farm experimentation. In my view the frequently inadequate use of biometrics in FSR work is a symptom of indifference to actual farming conditions. The tendency to rely on mean yield figures, and thus on blanket recommendations, implies a continuation of conventional on-station research (which is now implemented on-farm). Whereas the use of experimental designs and statistical methods of analysis (such as analysis of variance) in conventional on-station experiments aims at elimination of sources of variability, the design and analysis of on-farm experiments aim also at using variability as a source of information. Instead of considering diversity a problem, it could be regarded as a source of information (De Steenhuijsen Piters & Fresco 1996). However, a note of caution is in place here. To grasp the complexities of the variation in space and time of rainfed farming systems, is easier said than done. A comprehensive inquiry into the many diverse farming systems of East Africa is virtually impossible for outsiders: the manpower and funds required are simply not available. To my mind a pragmatic solution is to put the farmers central: farmers as experts in their own right who engage in adaptive management, supported by researchers who are committed to the cause of resource-poor farmers (section 3.1).

One can argue that a more central position of farmers must be ‘enforced’ by more countervailing power with the target group of resource-poor farmers. However, *even* with more countervailing power, decentralized research and extension structures, and higher salaries for researchers and extensionists, there is no guarantee that sustainable farming systems will be developed (section 4.1.3). These three factors are all components of the upper route in Diagram 5. A professional attitude -resulting in relevant and high quality research work, and in a holistic approach to the development of sustainable farming systems- might also emerge through the lower route. A holistic approach to the development of sustainable farming systems demands recognition of the multi-dimensionality of the development process (the ‘mix’ must be in order), and internalization of a farming systems perspective. Change agents -just as farmers- need to operate with a farming systems perspective in mind. A (whole) farming systems perspective is characterized by the dynamic interplay between structures and individual actors. Structures such as farmer organizations, research and extension organizations, other governmental and non-governmental organizations, economic macro-structures, and so on -each with their specific sets of rules and resources- are part and parcel of the farming systems perspective, in which a multitude of individual actors perform certain behaviors. In the analytical perspective that has been set forth in chapter 3 I have attempted to link the actor-structure debate to attitude-behavior models. The interaction between actors and structures has been linked to the upper and lower routes of attitude-behavior models. In spite of the existing structures, actors have a certain room for manoeuvre (or ‘exit’ options). In my view the room for manoeuvre of individual actors -their ability to perform certain behaviors- is not only based on evaluations of beliefs about consequences of those behaviors, but also on internal norms and values. Sustainable farming systems are most likely to emerge when both routes in Diagram 5 receive adequate attention. Both formal and informal linkages deserve attention. Later on I will argue that the creation of synergy in the ‘mix’ can be facilitated by the introduction of the concepts transcendental and collective consciousness, and through enlivenment of transcendental consciousness in the discursive consciousness.

In this chapter a general picture of the background against which FSR in East Africa is implemented has been provided: the area of application with its actors (A in Diagram 2) has been described. We also learned more about M (the FSR methodology) and F (the framework of concepts as presented in Diagram 5: chapter 3). In the next chapter a more extended list of operational problems in FSR will be presented, based on a review of FSR literature. In this way the main operational problems -to be selected at the end of the next chapter- will be grounded in my work experiences *and* in FSR literature.

5 REVIEW OF FSR LITERATURE, AND SELECTION OF MAIN ISSUES

Introduction

It might be possible that the operational problems which I encountered in my work experiences are not representative of the East African situation. In order to show that the operational problems listed in section 4.5 are not unique, but, conversely, quite typical of FSR activities in East Africa, I present in this chapter a list of operational problems based on an extensive review of FSR literature[1]. The answering of the main question raised in this study -why is it so difficult to improve the ability of FSR teams to develop sustainable farming systems- requires a *comprehensive* analysis of the actual implementation of FSR (section 1.2). I do not want to concentrate on one specific operational problem in the FSR approach, as most studies do, but I try to capture the whole field of FSR activities and problems. This attempt to be as comprehensive as possible, results inevitably in a long list of operational problems. Yet I think it is necessary to follow this approach in order to reveal the many difficulties in the implementation of a holistic approach to agricultural research. As we will see at the end of this chapter, the holistic nature of FSR is precisely one of the main issues around which many operational problems centre.

5.1 Discussion of operational problems

In Table 6 a list of 15 operational problems is presented which will be discussed one by one in this section. The table indicates whether or not the operational problems occurred in my four work experiences. The overall conclusion from this table is that virtually all problems transpired in each of my work experiences. All the operational problems listed at the end of chapter 4 (section 4.5) appear in this review of FSR literature. This is a strong indication that these operational problems are representative of the East African situation, and that they are not arbitrary and *ad hoc* problems faced by the author. It is evident that all problems do not necessarily emerge in each FSR program, but nevertheless most problems will be familiar to FSR practitioners in the East African region. The 15 operational problems are frequently mentioned in FSR literature, as illustrated by the numerous references in this chapter. In a similar vein as the interpretation of my work experiences in chapter 4 was based on the analytical perspective presented in chapter 3, the interpretation of FSR literature in this chapter is also partly based on the same analytical perspective. Since the emergence of operational problems in work experiences and literature cannot be detached from analytical perspectives in the minds of researchers, I have explicated my perspective in chapter 3.

Although a good number of the operational problems are not specific to FSR and have hampered conventional research on a continuous basis, some specific problems cropped up due to the introduction of the FSR approach. Moreover, FSR is more strongly criticized on operational problems than conventional disciplinary and commodity research, precisely because of its claim to

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1. Although the FSR literature consulted is not confined to the East African region, I have tried to include as many references to East Africa as possible. In two recent publications on FSR (Meindertsma 1994; Mutsaers 1994) the FSRT-WP in Zambia as well as the Lake Zone FSR team in Tanzania are discussed. These two teams are known to be among the best FSR teams in their countries. My experience in FSRT-WP in the years 1994 and 1995 indicates that FSR still has a long way to go to meet its objectives. For teams without long-term donor support the situation is even more problematic.

be a holistic approach to research. Many of the problems are interrelated and do partially overlap, which makes it virtually impossible to rank them in order of importance. I have chosen to group the problems in three categories: those ones related to **relevance of research**, **quality of research**, and **interdisciplinarity in research**.

Table 6: Occurrence of operational problems in four work experiences

Operat. problem	Description	INIA Mozamb.	LTVIP Kenya	UAC Tanz.	FSRT-WP Zambia
1	Lack of systems perspective	+	+	+	+
2	Lack of client-oriented attitude	+	+	+	+*
3	Lack of farmer participation and lack of countervailing power	+	+	+	+**
4	Lack of participatory attitudes with researchers and extensionists	+	+	+	+
5	Neglect of indigenous knowledge and gender issues	+	+	+	+
6	Lack of feedback to OSR[1] and weak priority setting	+	n.a.	+	+
7	Lack of collaboration FSR-OSR and weak institutionalization of FSR	+	n.a.	+	+
8	Lack of involvement of extension and NGOs	+	+	+	+
9	Lack of ecological sustainability	+	+	+	+
10	Neglect of variation in time and space	+	+	+	+
11	Neglect of role of intuition	+	+	+	+
12	Lack of quality in field experimentation	+	-	+	+
13	Lack of balance in breadth & depth of research	+	+	+	+
14	Lack of incentives and resources	+	+	+	+
15	Lack of interdisciplinarity	+	-***	+	+

+ = operational problem occurred
- = problem did not occur
n.a. = not applicable.

1. OSR = On-Station Research.

* = Although FSRT-WP staff members were client-oriented, this did not apply to all on-station researchers.

** = In FSRT-WP farmer participation was consultative rather than collaborative.

*** = LTVIP-Kenya was not an FSR project, but the interaction between disciplines was quite satisfactory.

Relevance of research

1) *Lack of systems perspective. The claim by practitioners that FSR is a more holistic approach than conventional research is difficult to sustain when looking at actual practices of many FSR programs. The (farming) systems perspective is restricted or absent.*

In the diagnostic phase of many FSR programs the *whole* farming system serves as the framework for analysis, but in later stages a reduction of the holistic picture to one or a few technological constraints takes place (section 2.4). In theory one works on these few problems while maintaining the whole system perspective, which implies that the frequently complex interactions between interdependent components are explicitly recognized and taken into account (Woolley & Tripp 1994; Anandajayasekeram 1995). In actual practice, however, the focus is often on crop-technological issues or, at best, cropping systems, rather than the system as a whole (Swindale 1987; CIMMYT 1987; Lightfoot & Noble 1993; Frankenberger & Coyle 1993; Sevilla Guzmán et al. 1994). Quite some FSR is nothing else than on-farm research without any analysis of systems (Brouwer & Jansen 1989). In most FSR the definition of smallholders' production constraints is limited in two ways: 1) to technical rather than socio-economic problems; and 2) to farm level rather than institutional problems (Fresco 1984). Problems of different categories (technical, socio-economic and cultural) and different levels (farm level, regional level, etc.) are not tackled simultaneously. In a holistic FSR approach one would expect horizontal as well as vertical integration: integration of various disciplines at the farm level and integration between different levels, for example, between the farm and watershed levels.

Woolley & Tripp (1994) argue that the statement of some FSR practitioners that one should work on 'the whole system' is a misunderstanding of how diagnosis and planning work in practice. In the diagnosis and priority setting process a 'whole system' perspective inevitably reduces to a series of priority subsystems. To my mind the important point is whether the interactions with other subsystems are kept in mind: how does one maintain the farming systems perspective while working within single subsystems? In the end the concept 'farming systems perspective' implies "seeing things from the farmers' viewpoint" (Anandajayasekeram 1995). Although certain production conditions of smallholders can be simulated at research stations, other aspects, such as system interactions and farmer criteria, can only be studied properly under actual farming conditions, i.e., in farmer managed and farmer implemented on-farm trials (Van Leeuwen 1988)[2]. Adapted on-station research cannot replace on-farm experimentation. The systems, and therefore the farmer, perspective cannot be suspended (Norman 1994).

> "..only farmers can bring realistic 'holism' to a research project. .. .. 'technology' is only part of the story. Important political, social, and even religious concerns affect farmers, who must weigh technologies within a broader framework of 'life' " (Rhoades 1994).

2. In this context it is unfortunate that in on-farm experimentation the stage of verification trials often is not reached (except for variety testing).

On the basis of my work experiences I agree with Bawden (1995) who argues that FSR hitherto has been more systematic than systemic (section 2.5)[3]. The systemic competence of FSR practitioners leaves much to be desired.

The dilemma of FSR is that its holistic character raises high expectations, but at the same time the role of agricultural research in the rural development process is rather limited (Fresco 1989). Infrastructural bottlenecks and price policies, for example, are important issues but they are not within the realm of agricultural research. Researchers are faced with the dilemma which factors to treat as endogenous variables and which as exogenous parameters (sections 2.4 & 4.3.3). Some important institutional issues are: imperfect markets for inputs and agricultural products, lack of credit, inadequate economic policies, insufficient transportation and communication, weak or nonexistent farmers' organizations, and national agricultural institutions which are not client driven. These institutional factors can no longer be considered as external parameters, instead FSR projects have to internalize them, or, in other words, treat them as potential leverage points for the improvement of farming systems (Berdegué 1993; Baker 1993). The tendency in FSR to consider more and more factors as leverage points rather than as given external conditions is related to the Structural Adjustment Policy (SAP) reforms taking place in SSA. However, there exists a divergence between the FSR approach and the SAP approach. In the FSR approach change and growth are functions of technological innovation (Baker 1993), while in the SAP approach the policy environment is the critical variable with technological change taken as given - i.e., not problematic (Finan 1993). Unfortunately, markets in SSA are sometimes "incapable of performing their expected magic. .. even after 'prices are gotten right' much needs to be done" (ibid.).

Berdegué (1993) argues that there is no reason why the basic FSR methodology cannot be complemented with tools to put in place the 'institutional context'. The consequence is that individual FSR projects become more complex and expensive (section 2.4), and effective interinstitutional linkages must be established. The holistic character of FSR easily conflicts with the delineation of the system under study (Diagram 4): farm households are the principal units of analysis, but they are part of wider landscapes and communities (Gibbon 1994a).

FSR programs cannot provide cures to large social or political problems, unless they are part of wider rural development programs (Wilson et al. 1986; Mutsaers 1994). One such a (neglected) socio-political problem is the possible mass expulsion of smallholders out of agriculture - due to agricultural modernization- with no alternative employment opportunities available (Röling 1988:179). The question remains what FSR can contribute to protect the interests of resource-poor farmers in national policy formulation. The position and tasks of FSR in the wider context of the rural development process are not clear. Contributions to the formulation of agricultural sector policy have been virtually absent, and the relationship between scientists and politicians is problematic. The lack of an effective demand for policy research results is a general problem in policy-oriented research (Baker 1993). And do politicians listen to scientists? (we will return to this issue in section 8.3). Moreover, any change in orientation of research has opportunity costs and uncertainty (ibid.). Above all, it is evident that the coordination of the input of farmers, researchers, extensionists, input suppliers, credit and marketing organizations, private traders, NGOs, planners, donors, and

3. The lack of systems perspective is not restricted to the East African approach to FSR. According to Berdegué & Escobar (1995) the Latin American approach to FSR has been unnecessarily reductionist until the late 1980s. Addressing this reductionist nature of the conventional formulation of the systems approach must become the number one conceptual and methodological priority (ibid.).

politicians is difficult. The whole system perspective is hard to realize. The following operational problem is another major cause of little effective research for resource-poor farmers.

2) *Lack of client-oriented attitude. Effective agricultural research (on-station and on-farm) requires scientists with a strong client orientation, i.e., with a commitment to relevance of research.*

An analysis of 53 on-farm research initiatives in Zambia, Zimbabwe and Swaziland revealed that in 15 cases limited adoption of extension messages occurred, and in only 3 cases widespread adoption (of which 2 were crop varieties) (Low et al. 1991). Two thirds of the original research themes did not result in technologies being adopted. Relatively few researchers realize that inappropriateness of technology offered is a major reason for non-adoption by farmers in East Africa. Scientists easily blame non-adoption on institutional factors, while in fact these are just excuses for their technologies being inappropriate (Biggs 1985). This inappropriateness of technology is often caused by unrealistic levels of experimental and non-experimental factors in on-station and on-farm experimentation (chapter 4:Box 2; section 4.3.2; Box 9). On-farm research thus becomes a kind of conventional multi-locational testing, or on-station experimentation implemented in farmers' fields. A greater sensitivity to resource-poor farmers' conditions requires frequent contact with farmers.

> "... the first and most important achievement any FSR project can have is to bring the researcher in closer touch with farms and farmers in real-life settings. It is not easy to bring researchers to the field, especially after they have earned their Ph.Ds. ... Field exposure for LDC [LDC = Less Developed Country] researchers is essential, not only in the definition of the research problem but also in the development of a heart in the right place" (Castillo 1987)

FSR is first of all an approach and a scientist's attitude towards agricultural research (Stoop 1987a; IARCs 1987) (section 2.1). Unfortunately, agricultural research establishments in East Africa are dominated by technical professionals "with a 'modern' agricultural bias in their education" (Collinson 1988). While several International Agricultural Research Centers (IARCs) have implemented research to increase sustainability at low input levels (Woolley & Pachico 1987; Rhoades et al. 1987; Oasa 1985), few NARS in East Africa have adopted similar practices. At Uyole Agricultural Centre I was criticized for 'perpetuating agricultural under-development' when I tried to convince Tanzanian researchers to adapt their on-station experiments to smallholders' conditions.

The curriculum in higher education in agriculture needs a change from sophisticated mechanized agriculture to smallholder agriculture. Unfortunately, most university and college staff consider this a step backwards. A reversal of professional attitudes to resource-poor farmers and a promotion of professionalism with local and expatriate scientists is vital to progress (Collinson 1988). Hitherto FSR has failed to have an impact on agricultural educational programs (Gibbon 1994a): until today institutional orientations and professional attitudes are top-down. This professional paternalism can be caused by professional insecurity. The attitude of researchers towards on-farm experimentation is frequently characterized by fear of farmer participation. Basically many scientists still consider the farmer to be an unavoidable but interfering factor in the research process (Mutsaers 1994). One can argue that professional paternalism -the lack of a client-oriented attitude- is caused by the lack of countervailing power with resource-poor farmers (sections 2.3 & 3.1). With more countervailing power, farmers could (in theory) 'enforce' a client-oriented attitude and a farming systems perspective or, in other words, a holistic approach to their problems. As I remarked in section 4.1.3 there is, however, no guarantee that such a holistic approach, aiming at the creation of sustainable farming systems, will actually develop. I want to remark here that user control over research is a necessary but not a sufficient condition to establish relevant and effective research for sustainable agriculture. In The Netherlands user control is strong, but nevertheless the agricultural sector faces large problems (section 2.3). Farming interests have been able to oppose centrally imposed solutions to environmental problems, even if these solutions were sanctioned by farmer organizations and parliament (Röling et al. 1997). The lack of countervailing power with resource-poor farmers in East Africa leads us to the the next operational problem.

3) *Lack of farmer participation and lack of countervailing power with resource-poor farmers.*

Röling (1988) distinguishes three basic strategies to achieve linkages between farmers, and extensionists and researchers: DO TO, DO FOR and DO WITH. In my experience most conventional on-station research in East Africa can be classified as a DO TO approach: it is the progressive farmer approach. Farmers who do not adopt recommendations are viewed as traditional, ignorant or lazy. Most FSR falls in the category of the DO FOR approach: the objectives and content of research are largely determined by researchers, but it is focused on homogeneous target categories (recommendation domains in the FSR terminology). The drawback of DO FOR strategies is that researchers have a strong tendency to focus on problems they can solve. “The priority problems of target clients might be passed by altogether” (ibid.:56). In the DO WITH strategy the focus is on dialogue, participation and assisting clients in *their* search for solutions for *their* priority problems. Keywords are emancipation, self-reliance, self-realisation, personal growth, conscientisation, and so on (ibid:57). Farmers should develop ownership of the knowledge that they have generated together with facilitators, resulting in credibility in the new information which in turn helps to ensure application (Hamilton 1995:101; Chambers 1993). With increasing complexity of situations the more appropriate extension paradigm changes from ‘technology transfer’ to ‘problem solving’ to ‘education’ to ‘human development’ (Van Beek & Coutts: in Hamilton 1995:10). The concomitant ‘style’ of extension forms a continuum from persuasion to facilitation, and the range of required skills expands from skills in technology transfer to increasing people skills. In the ‘human development’ paradigm the target group is encouraged to govern themselves. The differing paradigms are complementary: each is appropriate for an individual, unique situation.

Although most FSR programs claim to operate within a DO WITH strategy, in practice only few really do (Heinemann & Biggs 1985). The participation of farmers is in many cases limited to providing information in the diagnostic phase and implementing (researcher-managed) on-farm trials in the experimentation phase. Farmer participation in selection of research topics and in experimental design of on-farm trials is still rare (Rhoades 1994). More participatory research strategies are needed to institutionalize feedback channels between farmers, and researchers and extensionists. Although feedback from extensionists to researchers about smallholders’ conditions is important, direct contact between scientists and farmers is indispensable for participatory research strategies (Biggs 1983). Farmer participation could be the missing link between formal research systems and informal farmer experimentation (Ashby 1986). Since the end of the eighties participatory technology development is a focal point in the rural development effort (ILEIA 1989). In diagnosis as well as in evaluation of technology FSR methodologies have become more participatory: transect walks, mapping techniques, matrix scoring and ranking, and so forth, are used. While farmer participation in priority setting for research still must be developed, farmer-participatory research is not an alternative to the FSR approach, but an addition (Mutsaers 1994).

As my Zambian case shows, collaborative farmer participation is not easy to establish (section 4.4.2). Gatter (1993) remarks that more participatory approaches in FSR must be accompanied by a decentralization of power "on a scale which remains a remote possibility in many states, Zambia included". Farmers need to be empowered: they must move from an object to a subject position which implies more than a change in government's rhetoric. For participatory technology development to be effective, technical innovations need to be complemented with 'social innovations' such as conscientisation and creation of farmer organizations (Hagmann 1993). The early ambition of FSR to give a voice to resource-poor farmers can perhaps finally be fulfilled through its links with grassroots organizations in the countryside which slowly are gaining power (Bingen 1994). Merrill-Sands and Collion (1993) emphasize that two interrelated issues of power - one within and one outside of research organizations- must be addressed:

> "We argue that to bring about lasting changes in the client-orientation of research organizations, the introduction of new research methods or improved management practices is not enough. We need to target the distribution of power, the decision-making processes, and the constellation of decision-makers within research organizations. At the same time, we need to support the development of farmers' organizations so that they can exert the external pressure needed to make research organizations more client driven. We conclude that farming systems research or farmer-participatory research alone cannot bring about such fundamental realignments in public sector research organizations".

There are two fundamental reasons for lack of user influence on public sector agricultural research organizations in LICs: 1) lack of internal motivation since government research organizations are not directly accountable to farmers; and 2) lack of external pressure because resource-poor farmers are not organized, and therefore do not have sufficient economic and political power to create a strong 'demand pull' (Merrill-Sands & Collion 1993) (section 3.1). In many cases FSR and FPR methods have led to more client-responsive *scientists*, but in only few cases to more client-responsive research *organizations*. Apparently, client-oriented research methods are a necessary, but not a sufficient condition to bring about change in research organizations. A major cause for this lack of impact on organizations is the neglect of political aspects. The inculcation of client responsiveness requires a reorientation in the values and attitudes of research organizations and researchers (ibid.), and institutional innovations and strong policy commitment (Merrill-Sands et al. 1991). Here the actor-structure debate crops up: the question is whether attitudes of individual actors *and/or* structures must change? (chapter 3: Diagram 5) (we will return to this issue in section 9.3).

It will not be easy to establish strong farmers' organizations. Some obstacles are: the lack of managerial, administrative and technical (for diagnosis, prioritization and communication) skills among resource-poor farmers; resistance from local elites or national governments; the risk of being co-opted as soon as farmers' organizations become influential; the risks of farmers' leaders pursuing personal agendas, the ambitions of local politicians, and the paternalism of NGOs; and the domination of well organized, large-scale, commercial farmers[4] (Merrill-Sands & Collion 1993).

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4. In Zimbabwe, for example, large-scale commercial farmers dominate research priority-setting (Merrill-Sands & Collion 1993). In an FSR workshop which I attended in Harare in 1995, a leader of a farmers' union emphasized the importance of irrigated agriculture for Zimbabwe. Savory (1991:16) indicates, however, that the potentially irrigable area is 1 per cent of all the land in Zimbabwe (the potentially arable area is 10 per cent of the national

Moreover, resource-poor farm households are not homogeneous (inter- and intra-household differences do occur) and sustainability and equity concerns make that the priorities of other actors must be taken into account as well. The research-policy interface -where researchers meet policymakers, planners and donors- is largely unexplored area in FSR. Another hindrance to strong farmers' organizations might be multi-national corporations with interests which run counter to the interests of resource-poor farmers.

All romanticism and rhetoric aside, the issue of farmer participation is not simple (Huijsman & Meinderstma 1994; Chambers 1994; Gubbels 1994). The frequently naive populist rhetoric about participation is largely 'preaching to the converted' (Scoones & Thompson 1994). Above all, it is evident that the participatory approach does not correspond with a top-down attitude. Active farmer participation requires democratic communication structures in communities, and 'participatory' personalities of researchers and extensionists - "factors which are often overlooked but on which success greatly depends" (Bingen 1994). Major changes in behavior and attitudes of individual scientists and extensionists are necessary (Gupta 1989; Worman et al. 1991; Baker 1991), the next topic.

4) *Lack of participatory attitudes. Many researchers have a top-down attitude towards extensionists and farmers, and many extensionists have a top-down attitude towards farmers.*

A top-down approach with little involvement of either extensionists or farmers is quite common in FSR programs (Barker & Lightfoot 1985). In traditional agricultural societies many government officials and politicians only pay lip service to the cause of resource-poor farmers. Researchers and extensionists do not associate closely with resource-poor farmers because of the low status of the latter in such societies, and because of different social backgrounds which can create difficulties in personal interaction (Wilson et al. 1986; Barlow et al. 1986; Merrill-Sands et al. 1991; Hagmann 1993). Attitudes of researchers towards extension personnel are characterized by feelings of superiority. Partly as a consequence of this attitude the extension services, for years, promoted research recommendations which were often irrelevant. Extensionists did not (dare to) complain to scientists about inappropriateness of recommendations (Dorward 1986a).

Box 12: Research and extension workers' perceptions and attitudes in Tanzania.
Lupanga (1986) studied perceptions and attitudes of Tanzanian researchers and extensionists. Some of his findings are presented in the next table. The answers of the researchers are ambiguous. On the one hand, a large percentage says that research recommendations are irrelevant and that they are not well informed about actual farmers' problems. On the other hand, only 13 per cent agrees with the statement that extensionists have little to extend. When the researchers truly believe that their recommendations are irrelevant, why are they then not adapting their research? A surprising statement of extension workers is that 65 per cent are in favor of enforcement of adoption through laws. Lupanga remarks: "That coercion was condoned at all by extension workers was bad news". He considers it an indication of the failure of the extensionists' educational mission. Resorting to 'police powers', he says, implies "the stereotyping of farmers as ignorant and conservative individuals who are incapable of adopting new ideas". Unfortunately, almost 40 per cent of the scientists have similar ideas. In research meetings at Uyole Agricultural Centre remarks about ignorant and traditional farmers were more than once ventilated. Also Lubawa (1985) confirms that Tanzanian extension agents advocate the use of pressure to force farmers to "use recommended practices for their own good". Millar (1996:32) reports for

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land). In Mozambique the agricultural researchers and government planners focus on the small 'sector privado' (section 4.1.1).

Ghana a similar ‘sock-it-to-them’ attitude. Another surprising statement is that extension workers are most to blame for non-adoption. Extensionists even accuse themselves more strongly than researchers do. This self-blame or guilt feeling of extensionists definitely does not boost the morale in the extension service. The credibility of extensionists must be improved through better training and by the provision of viable technological packages (Lupanga 1986).

Research and extension workers’ perceptions and attitudes: frequency of responses in percentages (n=138).

Perceptions and attitude indicators	Researchers who (strongly) agree	Extensionists who (strongly) agree
- Irrelevance of recommendations rather than farmers’ conservatism causes non-adoption.	70.9	49.4
- Researchers are ignorant about farmers’ problems.	50.0	45.7
- Research planning ignores farmers’ actual problems.	32.7	33.7
- Research in Tanzania produces few useful results.	41.8	67.5
- Extensionists in Tanzania have little to extend to farmers.	12.7	21.7
- Non-adoption of recommendations is mainly the fault of extensionists.	54.6	86.7
- Laws should be used to enforce adoption.	38.2	65.1

Source: Lupanga 1986 (adapted)

Effective participation of farmers requires less of the traditional, authoritarian teacher-pupil relationship and more “genuine collaboration and respect” (Biggs & Gibbon 1986). But active farmer participation can be interpreted by field staff as a loss of respect and power (Merrill-Sands et al. 1991; Hagmann 1993; Seegers et al. 1994). Unfortunately, in Africa the strongest advocates of participatory research methods are expatriates (Baker 1991). Although many NARS scientists have grown up on farms, they have -after university training- difficulty acceding to local farmers’ views. Moreover, the ability to empathize with resource-poor farmers often cannot be acquired by any training (Bingen 1994). With regard to participatory research in sustainable agriculture Lighfoot & Noble (1993) remark that the greatest hurdle is the reluctance of scientists to change “research styles that they have used for years and that are reinforced by peers, journals, and professional societies” (peer review is a component of the upper route in Diagram 5: chapter 3). Although the Participatory Rural Appraisal (PRA) approach -in which the mode of interaction is more visual and the analysis proceeds through diagraming- has the potential to empower the nonliterate, Chambers (1993) cautions that:

> “...much depends on context, rapport, and the behavior and attitudes of the facilitator. In PRA, behavior and attitudes are now considered more important than methods”.

Reversals of behavior and attitude are not easy, but the most effective way to change attitudes is to start by changing behavior “through the adoption of farmer-first methods” (Chambers et al. 1989:104)[5] (this refers to the feedback loop in Diagram 5: chapter 3). One can argue that changes in behavior -just start using the new methodologies- result in changes in attitudes, but how does the

5. Chambers (1989) says about his principle to change behavior before attitudes: “Preaching about attitudes invites acquiescence without deep change. Action means experience gained and that, more than exhortation, reorients attitudes and habits of thought”. At the same time, however, Chambers et al. (1989:169) remark: “Like a magnetic field, the pull of the normal [conventional professionalism in the TOT paradigm] is always there and reasserts itself once countervailing forces weaken”.

initial motivation to use new methods arise? (section 3.2). In my view attitudes underlie behavior, and although mutual interaction may occur, the most fundamental factor is attitudes. On the last page of his book Chambers (1989:195) says: "Change depends on personal decisions and action"- and that is in my view the correct starting-point: the primacy of individual action and change.

Rhoades' model for farmer-scientist interaction -the 'farmer-back-to-farmer' model- requires a 'psychological flip' with scientists (Rhoades 1994). According to Rhoades FSR is based on the philosophy of 'scientific positivism' which posits that human behavior can be reduced to scientific principles and can be quantified. However, the desire to assign numbers to things (as done in questionnaire-based surveys and even in informal surveys) plants "major barriers between scientists and farmers" (ibid.). The major cause of the lack of true farmer participation is "a lack of awareness of the differences between farmers' research methods and 'scientific' research" (ibid.)[6]. Scientists need to accept farmers as experts in their own right, be flexible, humble and tenacious, and have close contact with their clients. Hands-on experience through on-the-job, shoulder-to-shoulder interaction with farmers and extensionists is important (Landeck 1991). The need to instill the concept of the *dignity of farming* cannot be overstressed (Beets 1990:305). In FSR there is no substitute for 'missionary zeal' (Rhoades 1994). Two important aspects of the top-down attitude are the neglect of indigenous knowledge and the neglect of gender issues, the following topic.

5) *Neglect of indigenous knowledge and gender issues.*

Local farmers' knowledge has been long undervalued or even downright ignored by agricultural scientists. Since the eighties indigenous knowledge receives more attention (e.g., Brokensha et al. 1980; Richards 1985). However, the current 'craze' for rural people's knowledge entails mainly the extraction of indigenous knowledge, which is then 'patented' and re-introduced as a 'discovery' (Millar 1996:41). Hitherto advocates of indigenous knowledge have focused on the products of knowledge, on the technologies that can be extracted (ibid.:2). Such studies of indigenous knowledge fail to capture its holistic nature, and processes of indigenous learning are neglected. Millar (1996:45) uses in this context the concept 'cosmovision' which includes the interrelationships between spirituality, nature and mankind. It is a holistic worldview in which human society is part of nature, and people work and communicate with nature. Rural people's cosmovisions, including their spirituality, need to be integrated in participatory processes (ibid.:2). In addition to biological diversity also cultural diversity deserves attention. Huizer (1995:9) raises the following question:

> "Can Westerners really understand indigenous knowledge systems without adopting -or at least coming seriously to grips with- the broader (politico-religious) worldview of which these systems form an integral part ? And to what extent does such adoption imply the need to transcend the paradigmatic limitations of the Western scientific worldview...".

Richards (1989) sees agriculture as a seasonal adaptive *performance* (see also operational problem 10). With respect to the (sometimes naive view of) possibilities for interaction between farmers and agricultural scientists, he remarks that the possibilities for cultural mis-communication are enormous[7].

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6. Farmers employ intuitive operation in their research. Later on I will argue that the attempt to ban intuitive operation from scientific work is in vain and counterproductive, and hampers active farmer participation.

7. Richards (1989) says: "...aspects of life totally alien to agriculture in a scientist's eyes are eminently explicable when seen in performance terms. One example is the relevance of witchcraft beliefs in the process of screwing up the performer's nerves to 'concert pitch'. ... Much in the last category will appear to outsiders to be pseudo-

An example is the role of spirituality in traditional African societies in the facilitation of favorable environmental conditions such as rainfall and soil fertility (Schoffeleers 1978; Hagmann 1993; Huizer 1995; Millar 1996). One can argue that the habit of scientists to move unintelligible (unintelligible in the conventional scientific paradigm) issues into the realm of magic, is not a very scientific attitude. Ideally scientists must be aware of the limitations of the paradigm(s) underlying their scientific work, and be open-minded and willing to investigate alternative paradigms.

Another aspect of the top-down attitude is the neglect of gender issues. Women do 60-80 % of the agricultural work in African settings (Wilson et al. 1986), yet their interests are rarely considered in FSR activities (Fresco 1984; Jiggins 1986). Researchers tend to mask sex roles by using aggregating terminology such as 'family labor' and 'farmers', and intra-family dynamics are often overlooked. FSR teams tend to be all male. Technology development is directed to, and relying on information received from, male household members (Wilson et al. 1986). Although today most African and expatriate researchers are aware of the central position of women in agriculture, this awareness still has to be translated into actual consideration of women's interests in FSR programs. Whereas gender has become an increasingly important issue in FSR (Poats et al. 1988), a change of attitude in the male dominated research and extension system is still necessary.

> "Enough is now known about women's roles in agricultural production across the globe to argue persuasively that their continued neglect is a sign of downright lack of professionalism" (Röling 1988:99).

Gender differences and ethnic and socio-economic diversity can be interrelated (De Steenhuijsen Piters 1995). In order to make agricultural research more relevant to female and male resource-poor farmers the feedback function of FSR is important, the next topic.

6) *Lack of feedback to on-station research and weak priority setting.*

Feedback from FSR practitioners to on-station scientists, in order to adapt the research agendas of the latter to smallholders' conditions, is one of the most important functions of FSR, but, unfortunately, this feedback has been rather limited (Merrill-Sands & McAllister 1988; Haugeraud & Collinson 1990; Tripp 1991c; Merrill-Sands & Collion 1993)[8]. To my mind the major cause of this failure is the frequently strained relation between on-station researchers and FSR practitioners (see operational problem 7). The former accuse FSR of being not scientific, and criticize the superficial diagnoses of farming systems which cannot be used to set long-term research priorities (Gnaegy & Anderson 1991). The problem is not new, as in the past (before FSR became popular)

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scientific mumbo-jumbo. But to the performer ... scientific respectability is of little significance. It only matters that it works". With regard to the farmers' view of the non-controllable nature of farming, Berger remarks: "closely connected with the peasant's recognition, as a survivor, of scarcity is his recognition of man's relative ignorance. He may admire knowledge and the fruits of knowledge but he never supposes that the advance of knowledge reduces the extent of the unknown. This non-antagonistic relation between the unknown and knowing explains why some of his knowledge is accommodated in what, from the outside, is defined as superstition and magic. Nothing in his experience encourages him to believe in final causes, precisely because his experience is so wide. The unknown can only be eliminated within the limits of a laboratory experiment. Those limits seem to him to be naive" (Berger 1992; quoted in Portela 1994).

8. The impact of feedback of FSR on experiment station research is difficult to measure (Mutsaers 1994:49). Although FSR undoubtedly has influenced the thinking about on-station research, my experience teaches me that the actual impact on experimental work in East Africa has been small.

on-farm and village level research programs also failed to influence the content or direction of experiment station research (Biggs 1985). A solution could be to establish a direct linkage between on-farm and on-station research by placing them under the same directorship (see operational problem 7).

On-farm experiments and diagnostic surveys provide potential useful information for on-station researchers. Unfortunately, the translation of survey results into priorities for on-station and on-farm research is a weak link in FSR (Meindertsma 1994). Diagnostic surveys as such do not give insight into the relative importance of problems. As problems always will be abundant, priority setting in research is essential (Byerlee et al. 1982; Fresco 1984; Horton 1984; Mettrick & Wessel 1986; Plucknett et al. 1987; Nickel 1989). It is not uncommon that diagnostic surveys give descriptions of farming systems with long lists of problems encountered, but without any ranking of problems or without priorities for research. The identification of factors for experimentation and the design of a research program require, in addition to creativity of the research team and farmer participation, also a concrete procedure to structure the process (Tripp & Woolley 1989; Mutsaers 1994:4). In the early phases of FSR programs primarily researchers have been involved in setting priorities through rather ‘intuitive’ processes.

> “Making decisions intuitively has a number of disadvantages, both for the team and for its relationships with other individuals and groups. It makes readjustment in the face of changing conditions difficult. The lack of transparency inherent in intuitive decision making also stands in the way of communication, blocking both good interdisciplinary relationships within the team and participation from others. A more structured approach to priority setting is the key to strengthening FSR&D programs” (Seegers et al. 1994)[9].

To my mind the lack of interdisciplinarity within FSR teams and the lack of participation from other actors in the rural development process have more fundamental causes than intuitive operation (we will come back to this issue in the chapters 11 & 12). The danger of more structured procedures to priority setting is that unimaginative use of planning tools can result in a forgetting of the discussions and doubts that preceded the systematization of information in tables or diagrams. It can create an unwarranted feeling of certainty. Planning tools are not a substitute for “experience, intuition, intelligence or hard work” (Woolley & Tripp 1994). Priority setting is an often messy process. Expressions such as ‘reconciling conflicting interests’, ‘arriving at a workable compromise’, ‘a negotiating process’, and ‘a balancing act’ are used to describe the process (Huijsman & Meindertsma 1994; Merrill-Sands & Collion 1993). In my view attempts to structure the process of building consensus, both within and without FSR teams, will most likely continue to face difficulty in trying to get around this ‘messy’, and perhaps even unmanageable, character of priority setting[10]. It would be shortsighted to think that formal planning techniques can result in a sort of ‘mechanical’ procedure for priority setting: easily quantifiable objectives and criteria are hard to come by in development related research (Huijsman & Meindertsma 1994). In this context it is important that farmers -and not researchers- set the pace of the development process.

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9. Dent (1995) argues that in FSR practice ‘mental’ models are used which are implicit and non-formal. This makes that the judgements of FSR practitioners in research priority setting are “less easy to assess (and to share with others) than when the model is explicit and more formal”.

10. Systematic and participatory priority-setting exercises require broad and equitable participation. Research managers require skills to manage group decision-making processes involving “diverse stakeholders who often have competing interests and perspectives” (Merrill-Sands & Collion 1993). A consensus on research priorities, that reflects a balance of key stakeholders’ interests, must be negotiated.

Today it is recognized that farmer participation in priority setting for research is indispensable, but while participatory diagnosis is now well established, participatory planning methods still need to be developed (Woolley & Tripp 1994; Gibbon 1994a). It is important, however, to realize that research priority setting and planning ultimately is a political process. In the end it is not the formula for ranking priorities, but the balance of power among decision-makers, that makes the difference (Merrill-Sands & Collion 1993) (operational problem 3). The strengthening of farmers' input into priority-setting procedures does not move us beyond altruism, since the power to decide which agreed-upon plans will actually be implemented, stays with research organizations. Resource-poor farmers need more countervailing power (section 3.1). The hitherto weak priority setting in (on-farm and on-station) research is affected by the collaboration between FSR practitioners and on-station researchers, the next topic.

7) *Lack of collaboration between FSR practitioners and on-station researchers, and weak institutionalization of FSR.*

The lack of collaboration between FSR practitioners and on-station researchers (Mutsaers 1994; Norman 1994) is caused by the often strained relation between the two groups, which in turn is due to the fact that the very development of the FSR methodology implicated the non-adequacy of conventional on-station research. While most agricultural scientists will agree that thematic station-based research is the lifeblood of FSR -they are complementary (Norman 1994)- in actual practice the tension remains, even 20 years after the introduction of FSR. Although the relationship between on-station and on-farm research is not a 'mutually exclusive' or necessarily 'uneasy' one, it is likely to be 'leading-supporting' (Norman 1994: referring to Simmons, no date). Whereas such a relationship might have the biggest pay-off in the long run, it is important "to ensure that thematic research is not emphasized at the expense of adaptive research" (ibid.). According to Eicher (1989:19) FSR should serve as a handmaiden (servant) to commodity-research teams. He is in favor of restoring the primacy of commodity-based research. Most NARS in East Africa, however, are hitherto still mainly engaged in 'conventional' commodity-based research ('conventional' refers here to on-station research with high levels of experimental and non-experimental factors). The systems -and thus farmer- perspective certainly has not yet been institutionalized in most NARS. FSR is not an argument against a commodity focus, but against the research station focus (Birgegard & Fones-Sundell 1987). To my mind, the question whether on-farm research must serve as a handmaiden to on-station research, or the other way round, is irrelevant. The main point is that the whole research system needs to become permeated with a farming systems perspective. Merrill-Sands et al. (1991) argue that research managers must ensure that:

> "on-farm research is not perceived as a corrective measure for past failures to generate relevant technologies. Too often leaders of on-farm research try to gain political support by highlighting the deficiencies of applied station-based research. Nothing can undermine collaboration more quickly"

Whereas above remark is true, it is also a fact that FSR *is* a corrective measure and that FSR still finds itself in an underdog position.

Unfortunately, the bulk of the human and financial resources for agricultural research in many SSA countries are still spent on largely irrelevant, narrowly focused on-station research. Thus, the feedback role of FSR is still relevant. FSR practitioners face the difficult task to simultaneously collaborate with on-station researchers in an harmonious mode *and* to convince them to change their research agendas. Especially when an FSR unit comes in as yet another autonomous group, besides already existing commodity or disciplinary groups, frictions can easily develop (Biggs & Gibbon 1986). The parallel existence of an on-farm group and several on-station groups does not facilitate FSR's feedback role (Mutsaers 1994:8). The institutionalization of a farming systems perspective in NARS through autonomous, donor-funded FSR projects is problematic[11]. Moreover, the financial sustainability of such projects is low (ibid.:9).

Box 13: Eicher's (1989) critical opinion of donor support to African NARS.

According to Eicher (p.25) donor support to African NARS *postpones the day of reckoning* "- i.e., developing local political support to finance the core costs of NARS from domestic sources as the key to sustainability of NARS". The critical question of financial sustainability of NARS has been dodged. He speaks of the resource-transfer model of foreign assistance, or the 'revolving-door model of foreign advisors and overseas training', that postpones the tough issues (p.7). Instead of the opinion of many donor agencies that African countries should spend 1 to 2 per cent of their agricultural gross domestic product on agricultural research -a norm derived from industrial countries- Eicher (p.21) argues that some countries overinvest in research "relative to their current stage of institutional maturity, absorptive capacity, scientific leadership, political support for research, and projected government revenues". His thesis is that "many African countries are generations, and a few are several centuries, behind Asian and Latin American countries in terms of their stage of human capability and institutional and political maturity" (p.26). The African continent counts many national states, but few nation-states. The stage of scientific, political, and institutional maturity of individual African countries determines whether foreign aid "can be absorbed with integrity" (p.2). The challenge is to develop a human-capability model with the following three hallmarks: "1) the slow, step-by-step process of improving the quality of the scientific, managerial, and financial capacity of a NARS, 2) upgrading the quality and relevance of research programs, and 3) developing support from clientele groups to finance and sustain the research system from domestic sources" (p.25). Eicher speaks of a trade-off in quantity versus quality: most African NARS need to freeze or reduce the number of employees and "concentrate on improving the quality of scientists and their research programs and replacing expatriates in the process" (p.18). Eicher is one of the few authors who is also critical of the behavior of donor agencies. In his view donors are an integral part of Africa's agricultural research dilemma, since they use "lower standards of performance in evaluating investments in Africa" (p.23)[12].

The alternative to donor-funded FSR projects is the promotion of a farming systems perspective within existing organizations and among existing staff (Birgegard & Fones-Sundell 1987; Stoop 1987a; Mutsaers 1994). Since modifications of organizational structures and management processes tend to be marginal and slow, one must, from the outset, explicitly take into account the needs, capabilities, resources and past activities of the client research institution (Heinemann & Biggs 1985). A top-down transfer of FSR programs from donor to research institution is in contrast to the philosophy of FSR. A complicating factor, however, is that different groups of people (local researchers, donors, farmers) have differing interests and 'hidden agendas'. Political pressures, professional interest groups and sources of internal or external funds often are key determinants in understanding local research and extension systems (Biggs 1985). The donor-funded 'special

11. Mutsaers (1994:61) correctly argues that the establishment of separate FSR teams is in fact in contradiction with FSR's philosophy to permeate the whole research system with a farming systems perspective. However, this early *ad hoc* solution was the only way to demonstrate the FSR methodology to sceptical on-station researchers, and to provide client-oriented research to developmental and extension organizations.

12. I have experienced a similar attitude with many expatriates in Africa. Frequently the statement 'this is Africa' is used as an excuse for low standards of performance (of their local colleagues and/or themselves). It is accepted, for example, that coefficients of variation of on-station and on-farm experiments implemented in Africa are higher than in the rest of the world. To my mind, there is no reason whatsoever why Africa should settle for standards of performance in field experimentation which are below the ones accepted elsewhere in the world.

project' status of many FSR programs was an attempt to get round what expatriates perceived as local 'hindrances'.

The institutionalization of FSR in NARS is an evolutionary, step-by-step process which is hampered by two conflicting requirements: 1) decentralization of on-farm activities in order to serve many diverse production environments; and 2) concentration of scarce human and financial resources (Stoop 1987a). The reconciliation of these two requirements is not easy and demands high-level policy decisions. Collinson (1988) remarks about African institutions: "Even where it forms part of the rhetoric, one has to ask how serious is the call for decentralisation - of administration may be, but of authority?". Decentralized on-farm activities create a great demand on locally available organizational and managerial capabilities.

Mutsaers (1994:64) proposes to post a small number of experienced FSR facilitators in regional research institutes where they have to integrate FSR methods in the research program. They have to promote and support client-oriented research with all researchers. The research institutes are supposed to implement adaptive research on a contract basis for developmental organizations. It is important to remember that the mass of resource-poor farmers depends on public sector NARS, not on private sector agricultural research (Tripp 1991c). My experience as Adaptive Research Adviser at Uyole Agricultural Centre in Tanzania, the experience of FSRT-WP in Zambia in 1988 with 'service research' (sections 4.3.1 & 4.4.6), my other work experiences, and the analysis of FSR literature in this chapter lead me to conclude that -*ceteris paribus*- the FSR facilitators face an almost impossible task (see section 4.4.6 for a detailed discussion of the linkages issue)[13]. However, an ideal model for organizing on-farm research does not exist (Merrill-Sands et al. 1991; Norman 1994). For each specific situation the actors involved will have to choose the most appropriate arrangement. Despite positive work by FSR teams, the problem of conservatism with many on-station researchers remains to be solved (Gibbon 1994a). In addition to more collaboration with on-station researchers, FSR practitioners also need to cooperate more with extension workers and NGOs, the following issue.

8) *Lack of involvement of extension and NGOs.*

The 'technology transfer' step in FSR programs tends to exist on paper only (Johnson & Claar 1986). Although demonstration of improved technology occurs only at the end of the FSR sequence of activities (Diagram 3 in chapter 2), extension staff must be involved right from the beginning: extensionists can contribute important insights to the diagnosis of local farming systems and to priority setting for research. Unfortunately, the contribution of extension to FSR priority setting has often been minimal, even where special committees and meetings have been installed. It is important to emphasize that for village level extensin workers it may be difficult to be effective participants in formal and quantitative approaches to priority setting. Their input can be better ensured through more informal mechanisms (Eponou 1994). The same applies to effective input from farmers.

Tensions and conflicts between FSR practitioners and extensionists are quite common: the two groups see each other as competitors rather than partners (ibid.). Developing true partnership proves often difficult. One of the reasons is researchers' attitudes: a sort of 'pecking order' exists in which researchers are portrayed as 'white collar' workers and extensionists as 'blue collar' workers (ibid.). This has to change since it is evident that FSR alone will never be able to reach the large

13. Mutsaers (1994:64) reports that this model has been recently introduced in some projects in Tanzania, Kenya and Benin. It is too early to judge its effectiveness.

number of resource-poor farmers. Even if ‘reversals’ of scientists’ attitudes are possible on a large scale, “the ratio of ‘converted’ scientists to resource-poor farmers would still be very small” (Petch & Mt.Pleasant 1994). In order to cover adequately the huge target group, well-functioning extension services are imperative. Even more important than *who* extends the newly developed technology, is the question *what* the content of extension messages should be. Inappropriateness of technology has been, and still is, the main reason for non-adoption by farmers (operational problem 2). Inappropriateness of recommendations also results in disrespect of farmers for extensionists and researchers. In most countries in SSA the Transfer of Technology extension model is still dominant. The suboptimal and conditional recommendations -as emphasized in FSR- conflict with these TOT-based extension approaches (section 4.4.4). Seegers et al. (1994) say:

> “While the qualities of individual participants certainly play an important role in establishing linkages, limitations due to the overall institutional structure of research and extension often cannot be overcome by well-motivated individuals alone”.

With regard to institutional barriers, and the relationship between structures and individuals, I refer to earlier remarks in chapter 3 (Diagram 5) and section 4.4.6.

The recent emphasis on involvement of NGOs in FSR activities is commendable insofar these organizations really represent farmers’ interests. NGOs can assist in creating effective ‘demand-pull’ on government services: they can act as ‘brokers’ between farmers and research services, but the danger of altruistic organizations representing farmers -rather than empowering farmers to represent themselves- is always there (Merrill-Sands & Collion 1993; Farrington & Bebbington 1993) (section 3.1). A precondition for closer NGO-GO collaboration are prior informal contacts “necessary to build up mutual trust” (Farrington & Bebbington 1993). NGO involvement will not be easy since most (local) NGOs do not have funds for research purposes: they do not often have a research orientation. NGOs certainly can contribute to the cause of resource-poor farmers, but they are not a panacea for all problems in rural development as seems to be suggested by the current (donor) craze for NGO involvement and privatization[14] (Gubbels 1994). NGOs cannot replace public sector research and extension organizations. The danger is that NGOs can divert attention and resources away from the development of a poverty-focused national research and extension capability (ibid.).

9) *Lack of (ecological) sustainability.*

Many FSR projects focus on annual crops and have a tendency to neglect perennial crops, trees, agro-forestry, erosion and soil fertility management, livestock, food processing, storage technology, female labor productivity, and off-farm sources of income (Fresco 1984;1989). Most of these issues require long-term research involvement, and inclusion of livestock and trees in FSR programs adds methodological complexities (Zandstra 1987). However, without more attention for these issues FSR cannot maintain its claim to be a holistic approach to agricultural research. Several of the issues mentioned above are related to the ecological sustainability of farming systems and to natural resource management, an increasingly important topic in the development field and, thus, in FSR. The concepts holism and sustainability are closely related (section 1.2).

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14. The donor craze for NGO involvement results also in NGO ‘headhunting’ of the best GO researchers (Farrington & Bebbington 1993).

Although hitherto FSR has mainly focused on the farm level, there is no (theoretical) reason why the criterion 'sustainability', and natural resource management at levels of integration above the farm, cannot be incorporated into the FSR approach (Mutsaers 1994:5). One can wonder, however, how easily a systems perspective, which proved difficult to realize at farm level, can be realized at the level of watersheds or regions. The complexity of problems at above-farm level will certainly be manifold. On the other hand, when natural resource management is promoted as a completely new research direction, the danger is that earlier mistakes of the FSR movement will be repeated (section 1.1). A complex issue is that farmers and scientists often have differing viewpoints with regard to natural resource management (Seegers et al. 1994), which makes it difficult to achieve full farmer participation (section 4.4.4 and operational problem 2). Landeck (1991) argues that unless FSR can figure out "how to make the rains fall in a timely manner, it likely will take a backseat to subsistence farmers' immediate concern with daily survival". Natural resource protection at different levels demands use of scarce resources such as labor, space, sometimes capital, and energy spent in community organization (Budelman & Van der Pol 1992).

Relatively new issues such as sustainability and gender need to be integrated effectively -not only in words- into agricultural research and extension.

> "Otherwise, the new developments become simple appendices that are not internalized within the conceptual and methodological framework of FSRE.[15] ... It is also necessary that they permeate FSRE in an efficient and synergistic manner. This has not been easy with gender issues and, if anything, it will be even more difficult with respect to the question of sustainability. ... I wonder if most FSRE teams are adequately equipped, conceptually, methodologically, and financially to deal with this complexity" (Berdegué 1993).

A shift in focus from farm to above-farm level, and from short-term to long-term time frame, is appropriate, but while FSR is a seemingly logical home for sustainability concerns, the fit is not perfect in terms of most NARS and FSR teams. The increasing complexity makes that the gap between what needs to be done and what can be done grows (Posner & Gilbert 1991). To my mind it is obvious that most FSR teams in East Africa are not able to add extra 'tools' to the basic FSR methodology. It has already been difficult enough to implement the basic methodology in a satisfactory way.

Environmental degradation is easily seen as everybody's problem but nobody's responsibility, resulting in inertia (Huijsman 1995). Local-level concerted action and empowerment is necessary to avoid this. People-centered natural resources management must be based on actor-oriented approaches[16] *and* systems thinking, on a combination of micro *and* macro perspectives (ibid.; Budelman 1996). Key features of natural resource management include interdependencies, conflicting situations, power relations, decision-making mechanisims, and empowerment of local institutions. Natural resource management approaches face the same problem as FSR, in that a balance needs to be found between complex, interdisciplinary approaches and approaches that are applicable for practitioners[17]. Another challenge in natural resource management is the issue of

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15. FSRE = Farming Systems Research and Extension.

16. In actor-oriented approaches the different life-worlds, interests and strategies of a multitude of actors are explicated (section 3.4). We will return to this issue.

17. Huijsman (1995) says: "The underlying dilemma is that if the approach is too specific, it loses the holistic context that is necessary to develop comprehensive strategies for natural resource management. On the other hand, if too broad, the approach becomes synonymous with the concept of development itself and may lack an operational and pragmatic orientation of what can and should be done in agro-ecosystem management".

vertical integration: one has to strike a balance between central government regulation and local autonomy. Without concrete changes in the macro-environment participatory approaches aimed at empowerment and learning-by-doing will lose momentum. Participatory learning and action processes take time to mature, and the rate of environmental degradation might outrun “the speed with which and the scale at which participatory approaches may have an impact on natural resources management” (Huijsman 1995). An important aspect of ecological sustainability is the variation in time and space of farming systems, the next topic.

10) *Neglect of variation in time and space of farming systems.*

FSR often oversimplifies the complexity of farming systems of resource-poor farmers. In an article on the attempts of FSR in Zambia to meet the potentially contradictory goals of household food security and environmental sustainability, Drinkwater & McEwan (1994) say:

> “This also requires recognizing the diversity of land types and the complex ways in which farmers integrate the effective use of different econiches according to intra- and interseasonal changes”.

This statement confers the complexity of farming in SSA. The diversity of fields and farmers needs to be understood (De Steenhuijsen Piters 1995). Resource-poor farmers in the risk-prone farming systems of East Africa attempt to exploit environmental heterogeneity both in time and space. They do not control or exclude environmental heterogeneity, but manage it through “adaptation of agricultural practices to the biophysical environment” (De Steenhuijsen Piters & Fresco 1996). Richards (1989) sees agriculture (including farmers’ experimentation) as a seasonal adaptive *performance*, not as a preplanned set of activities. Farmers respond to the natural, economic, and social exigencies of a particular season. The adaptive performance of resource-poor farmers in their complex, diverse, and risk-prone farming systems depends on unpredictable weather, and “the interplay over time of farming activities with the household’s resources” (Chambers et al. 1989: p.xviii).

Usually descriptions of farming systems are based on ‘single-period’ observations. Although in literature the iterative nature of FSR is emphasized, the practice is that fluctuations over time are not considered (Maxwell 1986a). This is, among other things, due to the pressure to produce tangible results within a short period of time. A potential danger of the use (often by outsiders) of various short-cut research tools, such as Rapid Rural Appraisal techniques, is that the results are over-valued (Guijt 1988). The dynamic evolutionary nature of farming systems is easily neglected: historical trends in farming systems and the response of farmers to these trends deserve more attention (Peters 1988; Meertens et al. 1995). For example, through the dynamics of change individuals are exposed to new income-earning opportunities and risks, and traditional redistributive mechanisms are weakened. This dynamic nature of farming systems asks for flexibility in content of research programs, a flexibility which runs counter to the wish of some scientists to maintain as much as possible the status quo (Biggs 1985).

With respect to variability in space, FSR classifies farm-households into recommendation domains, a difficult and under-researched topic (Maxwell 1986b; Moore 1995). Especially in SSA with its large diversity in farming systems ‘ready-made’ technology development at the level of agro-ecological zones (in regional research institutes) is inadequate. The following factors can be used in stratification: agroclimatic zones, soil and land classifications, cropping and biological environments, farmers’ cultural practices, economic conditions, and socio-cultural conditions (Shaner 1984;

section 2.4 and Diagram 4). It is both difficult and time consuming to consider all possible combinations of foregoing bases for stratification in a systematic way. Therefore, it is an almost impossible task for outsiders to categorize farmers (Beebe 1994). Categorization is simply an educated, possibly intuitive, attempt to identify the most important factors in a particular context (Shaner 1984). The borders of recommendation domains, inevitably, are largely determined by the research topic, or the purpose of interventions (Fresco 1986:37; Röling 1988:69). Although in theory socio-economic as well as agro-technical criteria are considered important in classification, often only the latter are really used (Beebe 1994). Recommendation domains become then agro-ecological zones in which, for example, no differentiation according to farm size takes place (Fresco 1987; Peters 1988). Socio-cultural factors and indigenous learning processes are rarely used as factors for differentiation (Millar 1996:59).

Precision in zoning is costly, especially in mountainous areas (Horton 1984). There is always a tension between defining target groups or recommendation domains as detailed as possible and keeping research cost-effective. One inevitably has to compromise between cost-effectiveness and the fact that no two farms are exactly the same. No research program can "tailor technology precisely to every geographic zone and type of farmer" (Ewell 1988:31). And whilst interventions proceed, changes occur and thus zoning has to be adapted.

A generally applicable classification of diversity in farming does not exist (Leeuwis 1993:266). The segmentation of farmers into homogeneous target-categories is a theme which has not been sufficiently problematized in FSR, nor in extension science (ibid.:267). According to Beebe (1994) only a farmer-centered approach, which is based on provision of information on available options and on farmer training, can deal with variability. Farmers should be enabled to choose from a 'basket of options'. This emphasis on niche solutions for niche problems, however, conflicts with the bueaucrats' quest for blanket recommendations, and simple-to-transfer, universally-applicable quick fixes (Schiere 1995:54, 195). Nevertheless, fine-tuning of recommendations -or adaptive management- by farmers themselves must receive more attention than at present (Huijsman & Budelman 1996) (sections 3.1 & 4.5).

11) *Neglect of role of intuition.*

The last operational problem which contributes to low relevance of research is the neglect of the role of intuition in farmers' as well as in researchers' practices. While 'intuitive operation' has been mentioned by several authors in the discussion of the preceding operational problems, it is always mentioned casually. Intuitive operation does not get any explicit attention. In conventional science intuitive operation of farmers is not acknowledged due to its 'unscientific' character, and one pretends that it does not play a role in scientific work. In FSR and other related approaches intuitive operation of farmers is only acknowledged with hard data backup, and intuitive operation of researchers is not, or only in a negative context, discussed. Wallace & Jones (1986:270), for example, say in their book on social science in FSR:

> "The individuality implied in the activities of experts is one of the most divisive tendencies in FSR. Each expert on the team responds to concrete observations and 'intuitive' understandings to redesign their work plans. ... The continued functioning of an interdisciplinary team depends on the ability to formalize intuitions, and make them accessible to other team members... Individuality and intuition are special skills which experts bring to projects, but these same skills have destructive potential within implementation teams. ...two case studies...demonstrate the time and emotional energy devoted to 'battling-it-out' to a consensus within the team".

Wallace & Jones, and also Seegers et al. (operational problem 6), argue that intuitive operation can block interdisciplinarity. Later on I will argue that active enhancement of intuitive operation can diminish the large investments in time and emotional energy dissipated in 'battling-it-out' to a consensus (chapter 12).

Scheuermeier (1988) acknowledges in his methodology labelled 'Approach Development' that intuition alone is basis enough for action, since farmers mostly decide intuitively. Some researchers refer to intuitive operation in different words: Kleene (1989), for example, refers to insight in farming systems as *the art* of the profession. In chapter 12 we will deal extensively with the concept intuition. For the time being I just want to say that, in my view, intuitive skills must not only be accepted and respected, but also actively enhanced. Now we will turn to those operational problems which are related to the quality of agricultural research.

Quality of research

12) *Lack of quality in field experimentation.*

The quality of on-station and on-farm experimental work in East Africa tends to be rather low. My experiences in Mozambique (section 4.1.2: Boxes 2 & 3), Tanzania (section 4.3.2) and Zambia (section 4.4.3: Box 8) indicate that the quality of field experimentation offers considerable room for improvement (section 4.5). The low quality of field experimentation is reflected in the use of inappropriate experimental designs, inadequate trial husbandry, high coefficients of variation, and incomplete analyses. Statistical assessment is not a form of assessment separate from the assessments by the farmer, agronomist and economist. Statistical methods are a tool for interpretation of data that are considered relevant by the three groups mentioned (Van Leeuwen 1988). On-farm experiments, especially combined analyses across farms, are more difficult to analyze than on-station trials, and many on-farm researchers are not conversant with the appropriate statistical methods (Mutsaers 1994:7). However, not only on-farm researchers, but also many (local and expatriate) on-station scientists in East Africa have inadequate knowledge of biometrics, which hampers the development of high quality research work. The generally poor standard of biometry among agricultural scientists is a major constraint to the publication of research work in scientific journals. The development of biometry software has aggravated the situation: it can create with users the impression of an almost magical process, while they fail to recognize that biometry is not just the mechanical application of mathematical procedures (Spore 1996).

Sometimes agricultural researchers have serious problems in translating farmers' problems into suitable experimental designs. They are not always able to design other experiments than the conventional ones learned during their training. Researchers, in this respect, appear to be conservative, risk-avoiding and suspicious of any change: exactly the behavior they often ascribe to resource-poor farmers (Box 1988). A more flexible attitude is demanded in FSR. Some on-farm researchers are in favor of simple experimental designs for on-farm trials. More complex designs are thought to confuse farmers and to produce more ambiguous results (Woolley & Tripp 1994). In my experience most farmers do not have problems with more complex designs[18].

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18. In Western Province in Zambia some illiterate female farmers could draw an exact map of an on-farm trial with two replicates and four treatments. The position of the eight randomized plots was flawlessly reproduced by

It is evident that strong commodity and disciplinary on-station research is a prerequisite to successful FSR, and vice versa (Fresco 1984; Stoop 1987a; Huijsman 1989). Intense reviews of accomplishments and plans of each individual scientist, with “hard-hitting questions on methodology, focus and scientific integrity”, are required (Nickel 1989). These reviews should not be mere ‘show and tell’ performances if one wants to develop high quality research programs. Otherwise the danger looms large of “regressing to routine technology testing programs” (Merrill-Sands et al. 1991). A review of nine cases of successful on-farm research revealed two important and, at first sight, contradictory prerequisites for good on-farm research: 1) an exceptional degree of flexibility in the choice of research methods and in researcher-farmer interaction; and 2) a requirement for high-quality, rigorous agricultural science (Tripp 1991b). Since sound FSR demands both flexibility and rigor, it is not a simple kind of research. The next operational problem also hampers high quality research work.

13) *Lack of balance in breadth and depth of research.*

FSR is almost inherently too ambitious (Barker & Lightfoot 1985; Seegers et al. 1994). FSR projects tend to be over-extended, trying to do too much too soon. The all-encompassing, holistic character of FSR easily results in stagnation in the diagnostic, descriptive phase without moving on to technology testing or technology development (Gibbon 1994a). This prospect of ‘overload’ points to a desirability to balance the breadth and depth of research (Anderson & Hardaker 1987). This concept of balance in defining the breadth and depth of research is a major theoretical and practical problem in FSR (operational problem 1). It is obvious that research quality deteriorates as efforts become spread too thinly. FSR practitioners need to give priority to quality of research over quantity (section 4.4.3). Building in time for reflection can assist in this (Huijsman & Meindertsma 1994).

> “Because many things are done superficially and none thoroughly, there is little prospect of producing concrete results that can be adopted by farmers” (ibid.).

Frequently more data are collected in surveys and experiments than are really needed or are analyzed (Bingen 1994; Mutsaers 1994)[19]. Researchers easily lose themselves in data. They must fight the tendency to do excessive experimentation and to implement large surveys (Barker & Lightfoot 1985; Stoop 1987a). This ‘overkill’ in data is expensive in terms of researchers’ and technicians’ time. The present emphasis on gender issues and sustainability leads to a new wave of diagnosis and general characterization without sufficiently clear objectives: it is not always clear for what purposes the data will be used. Mutsaers (1994:55) recommends to distinguish between data collection for strategic and adaptive purposes: between information necessary for long-term research planning and steering of government policy, and information necessary for choice and evaluation of concrete innovations.

In general too little time is devoted to a search of already existing information (Plucknett et al. 1987; Seegers et al. 1994). In local as well as foreign archives a lot of valuable information can

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heart. I also agree with Woolley & Tripp (1994) that more complex designs can produce greater experimental precision and thus less ambiguity!

19. In Tanzania and Zambia researchers collected in agronomic on-station experiments information on plant height, flowering date, etc. These data were never analyzed or reported upon. In the final analysis only yield data were used.

be found. Re-analysis of these data can be worthwhile (Van Eijnatten 1983). A combination of locally available information with data from comparable situations elsewhere can be of great help in planning FSR (Huijsman & Meindertsma 1994). Although it may take some perseverance to 'browse' through old, often badly-organized filing systems, such an investment of time might prove to be productive[20]. Unnecessary (and expensive) repetition of earlier efforts can be avoided.

Most of the fieldwork in FSR programs is done by junior, inexperienced staff members in often remote areas (Bingen 1994; Mutsaers 1994:59). This easily results in poor quality field experimentation, low credibility and limited impact on other scientists in the research system. Without adequate supervision of more senior (local or expatriate) staff, junior workers sometimes just follow the outward 'form' of methodology at the expense of its 'content' (Barlow et al. 1986; Biggs & Gibbon 1986; Collinson 1988; Merrill-Sands et al. 1991). A plurality, rather than a unity, of methodology suits different FSR situations best (Castillo 1987; Huijsman & Meindertsma 1994). Junior staff, however, do not feel at ease with a 'basket' of methods and techniques from which they have to select the most appropriate ones.

Room for a systems approach to agricultural research is limited by the lack of "experienced generalist personnel with an interest in field work with farmers" (Fresco 1984). Excessive specialization of the few experienced scientists and little concern with practical, on-farm applications of research make it difficult to establish well balanced FSR (Stoop 1987a). Sound FSR demands broadly trained scientists who have frequent contact with their target group. To live and work on the countryside requires, above all, motivation. The next topic deals with this issue.

14) *Lack of incentives and resources.*

Problems such as low salaries, insufficient funds for operational costs and lack of transport frustrate many FSR projects. One of the factors explaining slow progress in FSR is researchers' low morale and weak motivation (Collinson 1988). Nevertheless, donor agencies continue to see insufficiencies of incentives and resources as 'minor details' in the formulation phase of FSR programs, with the consequence that after program start-up they are dismissed as 'unfortunate external effects' that prevent the FSR methodology from functioning efficiently (Heinemann & Biggs 1985). In my judgement it is important that donor agencies are prepared to allocate funds for topping up of local salaries tied to performance evaluations of local (and expatriate) staff (section 4.1.2: Box 4; section 4.3.1: Box 6; section 4.4.6). If FSR is to be successful, the lack of performance-related incentives needs to be tackled (Farrington & Bebbington 1993). While the problem of underpayment of researchers and extensionists in SSA is now widely recognized, little is being done about it.

> "Government agencies normally argue that the country cannot afford to increase the salaries of its civil servants, whereas donor agencies usually feel that various national regulations do not allow them to top up the salaries of staff working on projects funded by them. In many countries these attitudes have led to a serious vicious circle: No Pay > No Work > No Output > No Development > No Income > No Money to pay higher salaries" (Beets 1990:66).

Since on-farm research faces higher recurrent operational costs than on-station research (for operating vehicles, per diems, and hiring temporary personnel), and many institutes do not have

20. In Kenya, Tanzania and Zambia I had to spend quite some time in locating and 'digesting' such valuable sources of information. I have to admit, however, that such exercises mostly took place at the end of contract periods when I was less caught up in operational activities, and could create room for these undertakings.

funds for recurrent costs or have not allocated them for this purpose (Horton 1984), here also donor support is necessary. The conventional wisdom that on-farm research is more expensive than experiment station research is challenged in ISNAR's OFCOR study (Merrill-Sands et al. 1991). This study shows that the costs per researcher for on-farm research are about 60 % of the costs per researcher for the research system as a whole. Moreover, the opportunity costs of *not* doing research on farm must be taken into account: the final criterion of acceptance of new technologies by farmers cannot be dodged (Shaner 1984). Concerning the question of financial sustainability after withdrawal of the donor agency, I want to remark that it is impossible to predict what the financial position of East African governments will be in 10-20 years to come. Moreover, to date hardly any FSR project (or development project for that matter) in East Africa is 'sustainable', so perhaps it is an inappropriate criterion to apply at this moment in time. Whatever the case may be, I subscribe to Eicher's (1989) strong emphasis on improvement of the quality of research, preferably linked to financial support of local client groups (Box 13).

A related operational problem, which could have an impact on the relevance as well as the quality of research, is the evaluation of FSR programs. Follow-up of introduced technologies is rarely done in agricultural development (Rhoades et al. 1987). One obvious reason is that the evaluation and impact assessment of agricultural research in Low Income Countries (LICs) is difficult (section 1.1). Even when base line data (on yield levels, farmers' income, relevance of on-station research to resource-poor farmers, and so forth) from the starting period of the FSR program are available, it remains difficult to attribute the generally small increments to FSR activities alone. Average yield levels, for example, will only increase with 1-2 per cent per year (section 4.4.4), and these increments can be due to a multitude of factors. An appropriate criterion for evaluation of FSR programs could be the extent to which data collected in surveys and field experiments are analyzed, interpreted and utilized by various clients, such as researchers, policymakers, extensionists and farmers (Stoop 1987a). Data of on-farm research are generally considered to be rather 'soft' compared to data of conventional research, and thus less publishable. In agricultural research, however, "more pragmatic and impact-related measures of success" should be accepted than the number of publications (Anderson & Hardaker 1987).

The fact that many FSR programs have been funded by foreign donors and employed expatriate staff, makes them not really representative of the potential nor of the problems of such programs in LICs (Fresco 1984). This adds to the complexity of judging the potential and cost-effectiveness of FSR. Donor agencies send periodical evaluation missions to projects, but often follow-up on implementation of recommendations is lacking (sections 4.1.2 and 4.3.1), which results in low relevance and poor quality research[21]. Dent (1995) remarks that the cost-effectiveness of on-farm trial based FSR must be questioned, especially in areas characterized by climatic variability. Routine field experimentation should be (partly) replaced with computer models of crop and livestock enterprises. In East Africa, however, reliable input-data, hardware and software, and knowledge and skills on modelling are not available with countryside-based FSR teams. Now we turn to the last operational problem: interdisciplinarity in FSR teams.

Interdisciplinarity in research

21. Leeuwis (1993:186) argues that project evaluations are to a considerable degree self-referential. More often than not 'external' evaluators belong to the same social network as the project staff. In this way evaluations become institutionalized forms of self-referentiality.

15) *Lack of interdisciplinarity.*

Putting together a number of specialists in a *multi*disciplinary team does not guarantee *inter*disciplinary collaboration (section 4.4.5). Joint reports of teams often consist of individual contributions of each of the team members, bound in one volume: the end result is just the sum of the parts. Interdisciplinary collaboration, resulting in reports that are more than the sum of the parts, requires in addition to communication skills and respect for other disciplines, above all motivation. Team members will make great efforts to transcend barriers created by differences in culture, personality, age, education, experience, and so forth, when they really believe in interdisciplinarity (Mettrick & Wessel 1986). Often individual personality traits, which can be culturally determined, rather than interdisciplinary conflicts cause problems in collaboration. Team members must have compatible personalities (Maxwell 1986c; Vierstra & Ndiyoi 1994).

Successful interdisciplinary collaboration requires that all team members have insight in the farming system under study. FSR practitioners, however, should not be 'jacks-of-all-trades' but must be strong in their own discipline *and* be able to operate within a systems perspective (Huijsman & Meindertsma 1994). Competence in one's own field makes it easier for participating scientists to have the right attitude towards interdisciplinary cooperation. For insecure scientists it is difficult to have respect for other disciplines, and to comment upon work of colleagues of different disciplinary backgrounds. Team members should be *willing and able* to be team players (Norman 1994). Although it is critical to have the right individuals in FSR teams, interdisciplinarity is not automatic, it must be built in. Team building, resulting in good communication and in coherence among team members, is imperative (Seegers et al. 1994).

While interdisciplinary collaboration among natural scientists in FSR teams (for example, between agronomists and livestock specialists) can be problematic, the cooperation between natural and social scientists can pose even more problems. The same applies to agricultural research institutes, which remain dominated by (male) natural scientists (Gibbon 1994a). Social scientists comprised, on average, only 20 per cent of the on-farm researchers across the research systems reviewed in a nine-country study of ISNAR (Merrill-Sands et al. 1991). In addition to being few in number, social scientists in Third World countries also tend to be young and inexperienced. This makes it difficult for them to function as equal members in interdisciplinary teams (Horton 1984). Also, the few trained professionals in these disciplines seldom work at farm level: they work at planning or academic level (Stoop 1987b). All this makes that the involvement and impact of social scientists (especially rural sociologists and anthropologists) in FSR remains limited.

The involvement of social scientists in agricultural research has often been associated with conflict. Five interrelated explanations for such conflicts are: personal inadequacy, interdisciplinary communication barriers, poor group dynamics, inadequate institutional structure, and power struggle (Maxwell 1986c). Interdisciplinary communication barriers can be caused by differences in training between social and natural scientists. Social scientists are as a rule trained negatively -to evaluate and criticise- whereas natural scientists are trained in a more positive way -to interpret and act (ibid.; Box 1988). Frictions can easily develop when social scientists in agricultural research organizations have 'hidden agendas': sometimes donor agencies want them to re-orient research to resource-poor farmers. Hitherto social scientists are mainly engaged in diagnostic research, in which, unfortunately, farmers sometimes become objects of investigation to be measured - just as plants (Frankenberger & Coyle 1993). While this tendency to copy the methodology of natural science is ill-fated, it is desirable that rural sociologists and anthropologists acquaint themselves with the basics of agronomy. Training of natural scientists, on the other hand, needs to cover the rationale and context of social science methods as well as training in communication skills and institutional analysis (Maxwell 1986c). Biggs & Farrington (1993) recommend a political economy approach in FSR in order to reach the rural poor. Such a perspective requires "cross-learning among social and natural scientists within and beyond agriculture, and demands of them a keen sense of personal responsibility" (ibid.). In order to prevent team conflicts, strong team leadership must mobilize positive group dynamics. A group goes usually through the following sequence: 'forming, storming, norming and performing' (Maxwell 1986c with reference to Handy). Only after the third phase has been successfully completed, in which new norms and practices are established, the group will be stable and productive. The 'external' power of a donor agency should be a strategy of last resort to promote interdisciplinary collaboration, because "the use of external force may well change behavior without changing attitudes" (ibid.). Attitude changes are much harder to bring about than behavior changes (operational problem 4). Maxwell refers here to the upper route in Diagram 5, in which external force might result in compliance without creating internally motivated changes in attitudes (section 3.2).

In multi-cultural teams differences in values and norms can hamper interdisciplinary collaboration and thus effective implementation of research activities (Seegers et al. 1994). Cross-cultural conflicts in multi-cultural FSR teams can occur between local staff and expatriates, but also among local staff of different ethnic groups. For example, differences in use and perception of time among cultures can create considerable problems (Wilson et al. 1986). People's definition of a 'full-time' job can differ significantly (one should keep in mind that local researchers often must have more than one job in order to secure a reasonable income). And differences in judgments of 'how fast things should be moving along' can create difficulties (ibid.). Two examples of cultural dimensions which have an impact on economic development are: 1) the allocation of priority to 'being the best' versus 'trying not to be better than others'; and 2) an attitude of 'living to work' versus 'working to live' (ibid.). The last dimension, the work ethics in a society, is never discussed in FSR literature, although it certainly affects agricultural development, and can contribute to cross-cultural conflicts in FSR teams[22]. Another factor which might hinder interdisciplinary collaboration is the 'publish or perish' mentality in the scientific community: in the 'rat race' for scientific recognition the number of publications is the most important criterion, not the impact of scientific work on society or on the welfare of clients. Hitherto it is easier to publish monodisciplinary than interdisciplinary work.

5.2 Clustering of operational problems: the main issues

The basic FSR methodology as used in East Africa has been presented in section 2.2 (Diagram 3). This initially simple methodology has been under constant revision, and many innovations have been introduced: the farmer-first paradigm, PRA techniques, gender, informal

22. Whereas the effect of work ethics on rural development receives no attention in FSR literature, it features in many informal discussions. Although it is a 'sensitive' issue, which can easily degenerate into culturally or racially based statements, a more unprejudiced scientific approach to this topic should be possible. One of the few authors who says something about work ethics is Beets (1990:307), who remarks that the desire for material goods does not always translate into an inclination for increased productivity: the need to work harder -in order to generate surplus production to increase income to be able to afford more material goods- is not always recognized.

research and experimentation, and so on (section 2.1). These methodological innovations are no substitutes for FSR, but complement conventional FSR procedures which are flexible enough to incorporate the new techniques and methods (Anandajayasekeram 1995). For all operational problems discussed in the previous section FSR practitioners have suggested solutions that consist of modifications and/or additions to the basic FSR methodology (section 5.1). All these modifications/additions, however, make the methodology so elaborate that for most, if not all, FSR teams problems with practicability arise (section 2.4). Keeping in mind that in most cases FSR is implemented by teams of relatively junior researchers working under often difficult conditions, it will be clear that all these innovations easily 'overload' FSR teams (operational problem 13)[23]. Too demanding definitions of FSR result in approaches that are non-implementable by research systems in SSA countries. According to Birgegard & Fones-Sundell (1987) the only feasible solution is to simplify the FSR concept. Although simplification is made at a cost (in terms of relevance and reduced ambition levels), it is preferable over "a highly relevant but unfeasible approach" (ibid.). The dilemma is to strike a balance between holistic, interdisciplinary approaches and pragmatic approaches.

The long list of operational problems implies that a gap exists between FSR theory and practice. Apparently the holistic theory is difficult to put into practice. The ensuing feelings of amazement and frustration resulted in the 'why' question (section 1.2). Although the dichotomy in theory and practice has been inherent in the FSR approach since the beginning, it has become more pronounced in recent years with the introduction of many new methods and techniques. Already in 1982 Byerlee et al. noted the following paradox in the FSR approach:

> "There is a potentially serious inconsistency between our advocacy of a farming systems perspective as a holistic view of an often complex farming system and the use of research methods which are cost effective and emphasize rapid results".

The conventional approach to bridge the gap between theory and practice -incessant methodology improvement- results in useful new methods and techniques, but impact on the well-being of resource-poor farmers remains limited (this refers to the 'how' question: section 1.2). Although each single methodological innovation makes sense, the individual team members and the team as a whole cannot cope with the methodological complexity, interdisciplinary communication barriers, skill requirements, and organizational and managerial consequences (section 2.4). This indicates a need for improvement of human capability. Hitherto formal training has not succeeded in providing scientists who can handle the elaborate FSR methodology adequately[24]. The establishment of multidisciplinary teams alone is not sufficient since each team member must master the farming systems perspective -each individual needs to obtain a perception of the whole- before effective interdisciplinary communication and collaboration can take place.

In order to proceed with the answering of the 'why' question, I have attempted to cluster the long list of operational problems in main issues. The problems center around four main issues:

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23. Harrington (1985) summarized, somehow cynically, the difficult position of FSR teams when he said: "We have to be sensitive to the consumption considerations, we have to be sensitive to coconut intercropping, we have to be sensitive to the role of women, we have to be sensitive to this, we have to be sensitive to that. If we get any more sensitive we are going to suffer from sensory overload".

24. One notable exception might be Hawkesbury College (the University of Western Sydney) in Australia, which is committed to a people-centred systems approach (Scoones & Thompson 1994), but also here experience teaches that systemic methodologies are not easily adopted (see section 10.3).

holism, interdisciplinarity, attitudinal factors, and lack of countervailing power. In Table 7 I have indicated whether or not these issues play a role in the 15 operational problems. The table shows that the four issues capture the operational problems quite well. The main issues cannot be strictly separated, they are interrelated. If, for example, resource-poor farmers would have more countervailing power, they could (in theory) ‘enforce’ a holistic, interdisciplinary and client-oriented approach to agricultural research (operational problem 2). Holism and interdisciplinarity are key features of FSR theory and, thus, logical focal points in the clustering of operational problems in FSR practice. Attitudinal factors and lack of countervailing power are, at first sight, less obvious choices as main issues in FSR theory and practice. Although these two issues are (recently) regularly mentioned in FSR literature, they are to my mind insufficiently explicated. The analytical perspective presented in chapter 3 (Diagram 5) contributes to the elucidation of these issues: the selection of the issues becomes transparent, and the analytical perspective might suggest ways to handle them. The operational problems and the ensuing main issues are thus grounded in an analytical perspective (chapter 3), an analysis of my work experiences (chapter 4), and a review of FSR literature (chapter 5).

Table 7: Relevance of the four main issues (holism, interdisciplinarity, attitudinal factors, and lack of countervailing power) to the operational problems.

Operat. Problem	Description	holism	interdisci-plinarity	attitudinal factors	lack of counterv. power
1	Lack of systems perspective	+	+	+	+
2	Lack of client-oriented attitude	+	+	+	+
3	Lack of farmer participation and lack of countervailing power	+	-	+	+
4	Lack of participatory attitudes with researchers and extensionists	+	-	+	+
5	Neglect of indigenous knowledge and gender issues	+	+	+	+
6	Lack of feedback to OSR[1] and weak priority setting	+	+	+	+
7	Lack of collaboration FSR-OSR and weak institutionalization of FSR	+	+	+	+
8	Lack of involvement of extension and NGOs	+	-	+	+
9	Lack of (ecological) sustainability	+	+	+	+
10	Neglect of variation in time and space	+	+	+	+
11	Neglect of role of intuition	+	+	+	+
12	Lack of quality in field experimentation	-	-	+	+
13	Lack of balance in breadth & depth of research	+	+	+	+
14	Lack of incentives and resources	-	-	+	+
15	Lack of interdisciplinarity	+	+	+	+

+ = main issue plays a role in the operational problem
- = plays no role
1. OSR = On-Station Research.

As long as the four issues remain problematic, the gap between FSR theory and practice cannot be bridged. The question arises ‘why’ these issues come about. Without understanding ‘why’ these issues develop, the solutions currently proposed to solve them -more training and methodology development- are unlikely to make a great difference at the end of the day. Instead of adding or incorporating a continuously growing number of components in the FSR methodology, a more thorough examination of the issues is needed. According to some recent publications on FSR the fundamental problem lies not with the principles of the FSR approach, but with the implementation and management of FSR activities (Meindertsma 1994:9; Mutsaers 1994:49). Although at first sight this conclusion seems correct, at second thought it might be not. In my view the operational problems in the implementation and management of FSR activities originate from erroneous theoretical assumptions. Although the FSR principle -an attempt to a holistic approach to agricultural research- is commendable, it seems, unfortunately, to be based on a faulty theoretical framework. As a consequence more training and methodology development -which as such are useful tools- cannot be fully effective. It may be fruitful to investigate the scientific paradigms which lie at the root of FSR theory and practice. In order to enlarge our understanding the scientific paradigms underlying FSR theory will be discussed in the next chapter.

Before turning to the next chapter I want to clarify the concept 'attitudinal factors' as used in this study. In the next box some components of attitudinal factors are given. The various components cannot be sharply separated, often they are interrelated.

Box 14: Components of attitude.

In this study, the following components of attitude have been mentioned: a so-called apathetic, conservative, non-innovative or 'traditional' attitude of farmers; group discipline of farmers in irrigation schemes; attitudinal factors in the sense of motivation and commitment; attitudinal factors in the sense of 'willingness to change' or 'maintenance of the status-quo'; and attitudes of special importance to agricultural researchers: client-oriented attitude, no top-down but a participatory attitude, gender-sensitive attitude, attitude towards interdisciplinary collaboration, attitude in the sense of having a farming systems perspective/a holistic perception/a systemic competence, a professional attitude. In the remaining chapters some more attitudinal factors will be introduced: attitudes in the sense of worldviews, scientific paradigms (for example having a positivist attitude), basic attitudes towards nature, attitude in the sense of receptivity towards intuitive operation, and a spiritual attitude of life.

5.3 Conclusion

The main conclusion is that all operational problems center around four main issues -holism, interdisciplinarity, attitudinal factors, and lack of countervailing power- which demand a thorough examination before the gap between FSR theory and practice can be closed. In this chapter we learned more about M and A (Diagram 2): the FSR methodology (M) is not easy to implement, and the actors in the field of rural development in East Africa (A) face many problems. We also learned more about F (the FSR theory). We are now at the end of Part I (FSR theory and practice, and main issues selected) and proceed to Part II (Underlying paradigms). In order to learn more about underlying frameworks of ideas and concepts (F), the next chapter will focus on the scientific paradigms which underlie FSR theory and methodology.

PART II

Underlying paradigms

6 CHARACTERIZATION OF POSITIVIST AND CONSTRUCTIVIST PARADIGMS

6.0 Introduction

A thorough understanding of the problematic nature of the four main issues in FSR requires that the scientific context within which FSR developed and functions -its scientific paradigm- is explicated. When such an explicitation of underlying paradigms would not result in more understanding, then it might be necessary to extend these paradigms. A scientific paradigm is a general way of seeing the world as shared by members of a scientific community, and it provides models of acceptable ways to solve problems (Kuhn 1970). A paradigm also includes a *belief* in a certain ontology or reality-model (Van Hengel 1991), although scientists are not always aware of -and willing to explicate- this belief. Kuhn made clear, by pointing out the psychological and sociological aspects of science as a human undertaking, that scientists are not willing, and also cognitively and psychologically not able, to leave a 'falsified' paradigm immediately (Van Dommelen 1991). In scientific paradigms data are selectively interpreted and theories molded with mutually reinforcing circularity (Tarnas 1993:408; see also section 3.1). Kuhn observed that the selection and interpretation of data in each paradigm is so self-validating that "scientists operating within different paradigms seem to exist in altogether different worlds" (ibid.:437). Social norms and values, and social processes and power relations within the scientific community, play a role in research (including the peer review process). Compliance and identification are important mechanisms in the attitude/behavior of scientists (see the upper route in Diagram 5: chapter 3). The scientific approach to knowledge begins with the question: "Let us suppose... Let us suppose that..., can I then explain more phenomena better" (Röling 1988:184) - but it is not easy for scientists to step out of prevailing paradigms[1].

In this chapter a characterization of the positivist and constructivist paradigms, the two paradigms that underlie contemporary FSR theory and practice, will be given. An overview of the paradigms is presented in Table 8 in order to facilitate mutual comparison. This table includes a third paradigm -the transcendentalist paradigm- which will be introduced later (chapter 9). In order to show that the transcendentalist paradigm does not come out of the blue, and to reinforce the plausibility of this new theoretical framework, it will be grounded in existing scientific literature (chapters 7 & 8). Although the paradigms are presented here as separated 'frameworks of ideas and concepts', they do, in fact, partially overlap. The contrasts are emphasized for the sake of clarification of the different paradigms. Later on we will see that each paradigm occupies its own niche. Also I will make plausible that the transcendentalist paradigm does not run counter to the positivist and constructivist paradigms, but is rather an extension of these paradigms.

1. Kuhn has demonstrated that "scientists generally do *not* in practice fundamentally question the governing paradigm or test it against other alternatives, for many reasons -pedagogical, socioeconomic, cultural, psychological- most of them unconscious. Scientists, like everyone else, are attached to their beliefs" (Tarnas 1993:437-8).

Table 8: Characterization of the positivist, constructivist and transcendentalist paradigms

	Positivist paradigm	Constructivist paradigm	Transcendentalist paradigm
Ontology	- objective reality which can be known through the senses, ‘dis-cover’ an existing reality, realist ontology, ‘Ding-an-Sich’; - materialistic monism, realist and absolutist position; - assumes that the world is materialistic and systematic, and can be engineered	- most constructivists are not really interested in the ontological aspect of ‘objective’ reality, they leave aside whether the ultimate nature of ‘objective’ reality is materialistic or psychic, ontological side-step manoeuvre in constructivism; - materialistic or psychic (?) ‘reality’, different degrees of relativist position, moderate and radical constructivism; - assumes that the world is problematic and can be discussed	- perception, knowledge and reality are structured in consciousness, reality is different in different states of consciousness, socially-constructed reality is grounded in transcendental consciousness, in the field of creative intelligence; - psychic monism, a relative and universal reality co-exist, they can be distinguished but not separated, the paradoxical paradigm; - assumes that the world is holistic and that this non-duality can be directly experienced
Epistemology	-dualistic with no interaction, observer and observed are separate, independent; - the researcher is outside the system; - observer is neutral, detached, non-involved; - ‘spectator knowledge’	- dualistic with interaction, observer and observed are interactively linked, knowledge is socially constructed, partial perceptions, multiple perspectives, inter-subjective realities are interpretations of the mind; - the researcher is inside the system; - responsibility; - experiential knowledge based on communication	- monistic (oneness of subject and object in the universal world) and dualistic with interaction (in the relative world), observer and observed are both grounded in the field of creative intelligence; - the researcher can become the system; - identification, ‘the seer is the seen’; - experiential knowledge based on direct experience of unity

	Positivist paradigm	Constructivist paradigm	Transcendentalist paradigm
methodology	- sensory perception, experimental testing; - materialistic reductionism, quantitative, systematic; - mainly mono-disciplinary and multi-disciplinary; - verification in a community of objective spectators;	- dialectical debates resulting in 'more informed' constructions, communication, negotiation, facilitation of accommodation of different worldviews, also actor-oriented approaches emphasizing 'arenas of struggle'; - more qualitative, more holistic and systemic; - more inter-disciplinary; - verification in a community of intersubjective interpretors;	- methods for consciousness development, meditation, facilitation of accommodation of different levels of consciousness and, thus, realities; - qualitative, holistic; - trans-disciplinary, unity-in-diversity of the knowledge quest, science and spirituality; - verification in a community of trans-subjective meditators
nature and role of science	- natural sciences; - science is source of truth and innovation; - key words: explanation, control, prediction, solve problems; - problem solver; - impact through instrumentally manipulating causes; - studies consequences of human activity; - reductionist position / holistic position; - conventional on-station research, most FSR	- hybrid of natural and social sciences; - communicative interaction is source of truth and innovation; - key words: understanding, interpretation, participation, negotiation, mediation, facilitation of individual and joint learning, improve situations; - scientist is one of the active partners in the social construction of reality, equal participant, co-learner, facilitator; - impact through communicatively influencing goals and reasons; - studies human activity itself; - more holistic position; - some FSR which incorporated participatory methodologies	- hybrid of sciences and techniques for consciousness development; - access to pure consciousness facilitates truth and innovation; - key words: direct experience of unity, participatory basic attitude, facilitation of positivist- and constructivist-oriented methodologies; - equal participant, co-learner, facilitator; - impact through consciousness-mediated orchestration of goals, reasons and causes; - studies the underlying basis of human activity; - holistic position; - research with a farming systems perspective, science and spirituality

	Positivist paradigm	Constructivist paradigm	Transcendentalist paradigm
type of rationality	- instrumental rationality and strategic rationality; - values and norms are outside rational discussion, strict fact-value dualism; - focus on best technical means; - aiming at control and winning	- instrumental, strategic and communicative rationality; - values and norms are source of rational discussion, fact-value dualism suspended but it remains problematic; - goals / objectives are bone of contention; - aiming at control and winning, but also at consensus, learning, collective action	- insight in societal rationality, comprehensive rationality, wisdom; - experiential spirituality facilitates the cultivation of societally and environmentally friendly values and norms (basic attitudes), fact-value dualism transcended; - experiential spirituality guides application of knowledge and skills in societally and environmentally friendly direction; - aiming at synthesis of opposites, at transcending of paradoxes
type of system	- 'hard' systems thinking; - models are simplified representations of (parts of) the world; - the aim is to improve knowledge about the world by improving models; - goals are inherent to the whole;	- 'hard', 'soft' and critical systems thinking, coupled system of 'hard' ecosystem and 'soft' platform; - models are constructs of reality within the participant's mind; - the aim is to improve human performance through communicative interaction, to develop systemic competence, joint agency, group synergy, to empower participants, to stimulate action, social improvements are mediated through direct communicative interaction; - goals and boundaries are permanently (re)negotiated	- 'see' beyond hard, soft and critical systems 'thinking'; - models are structured in consciousness; - the aim is to facilitate enhancement of individual and collective human performance through direct access to the field of transcendental consciousness, the concept collective consciousness, social improvements are mediated at a distance through the field effect of consciousness, consciousness-mediated manageability; - setting of goals and boundaries facilitated by a 'high quality' collective consciousness of the system under study

	Positivist paradigm	Constructivist paradigm	Transcendentalist paradigm
role of extension	- Transfer-of-Technology (TOT), teaching; - transfer of data and information; - do to, do for	- facilitation of participatory learning processes; - sharing, interpretation and transformation of data and information; - do with	- integral human development; - transformation of attitudes; - do with, do themselves
basic attitude towards nature	- anthropocentrism; - despot - enlightened ruler - steward; - controlling from without	- less anthropocentric / more ecocentric; - partner - participant; - pursuing from within	- beyond anthropocentrism and ecocentrism; - "unio mystica" / unity with nature; - transcending dualities, resulting in participatory basic attitude
spirituality	- not relevant, or only recognized as transcendent or 'vertical' spirituality which is separated from science; - science and spirituality separated	- indigenous knowledge, spirituality as component of worldviews or cosmovisions that can be discussed, indigenous cosmology used to enhance empowerment of farmers; - (ecological) spirituality as an intellectual concept; - science and spirituality separated	- spirituality as the process in which one systematically trains the receptivity to gain regular access to transcendental consciousness; - ecological spirituality as direct experience of a fundamental and meaningful solidarity with nature, an inner experience of belonging to the great whole, an immanent or 'horizontal' spirituality; - science and spirituality are a differentiated union
role of intuition	- not acknowledged due to being 'unscientific'	- only acknowledged with hard data backup, but intuition accepted as a concept, a black box, a fact of life	- since everybody operates -at least partially- intuitively, intuition acknowledged as being important; - not only accept / respect intuitive operation, but emphasize the enhancement of intuitive skill, intuitive skill can be trained in the sense that receptivity to intuitive operation can be enhanced, synthesis of discursive reasoning and intuitive operation

6.1 Characterization of positivist and constructivist paradigms by various criteria

Three basic criteria must be made explicit in the description of any scientific paradigm: *ontology, epistemology* and *methodology* (Guba & Lincoln 1994: in Hamilton 1995:13). The *ontological* question deals with beliefs about the *nature of reality* -the nature of being- while the *epistemological* question refers to the *nature of knowledge*, and the relationship between the knower and what can be known. The methodological question asks how enquirers can go about finding out whatever they believe can be known. In addition to these three basic criteria, some more criteria will be used to characterize the various paradigms. The criterion *nature and role of science* gives a further specification of the two variants of the scientific mode of cognition that will be discussed here. The criterion *type of rationality* discusses the various forms of rationality encountered in science. The criterion *type of system* refers to the differences between 'hard' and 'soft' systems thinking, which play such an important role in contemporary agricultural science. And the criterion *role of extension* points to the important role of extension, in addition to research, in rural development. The criterion *basic attitudes towards nature* will be discussed in chapter 8, the criterion *spirituality* in the chapters 8 & 9, and the criterion *role of intuition* in chapter 12.

Ontology

In the positivist paradigm the ontological position is that a concrete reality exists, which is governed by immutable natural laws, and which can be known through the senses. In this realist ontology the 'things-in-themselves' are 'dis-covered'. The ontology of the positivist paradigm is materialistic monism: all phenomena, material and psychic, can be reduced to matter/energy, to physical-chemical processes (Van Dongen 1996). In this view also human consciousness can be reduced to neurochemical processes. The ontological position of positivists is absolutist in the sense that they claim that only one reality (the materialistic reality) exists.

The ontological position in the constructivist paradigm is not so straightforward. *Moderate* constructivists either take an *agnostic* stance toward 'objective' reality, or are *ontological realists* with regard to natural reality (common-sense realists) (Van den Belt 1997:5,252). *Radical* constructivists, on the other hand, assert that both 'nature' and 'society' are being 'co-produced' by science (ibid.:5). To my mind, most constructivists are not really interested in the ontological aspect of reality. They leave aside whether the ultimate nature of 'objective' reality is materialistic or psychic: they side-step the issue. For them knowledge is a social process between people, and all references to so-called existing realities outside or beside this knowledge, are in principle illusory[1b]:

1b. According to Capra (1996:269), Maturana & Varela (1987) assert that a material world exists, but without inherent characteristics. There are no objectively existing structures, there is no 'Ding an sich'. No things exist independently of the cognition process. There is no territory from which we make a map; the making of the map produces the territory. Cats and birds, for example, see trees in a different way than we do, because they see different light frequencies. The 'trees' that they 'produce' are different from our trees. Maturana and Varela say that the world we produce depends on our physical structure. Living systems are characterized by three crucial criteria: structure, pattern and process. Structure refers to matter, substance and quantity, while organizational pattern refers to form, order and quality (Capra 1996:160). The organizational pattern is the complex of relations that determines the essential characteristics of a system, while the structure is the material embodiment or manifestation of the organizational pattern of the system. And the process of life is the activity which results in such references do not take serious the inescapable limitation of human knowledge (Luyten 1995) (I will return to the ontological side-step manoeuvre in constructivism in section 10.1).

Epistemology

The epistemological position in the *positivist* paradigm is that the observer and the observed object are independent of one another. It is a dualistic epistemology in which subject and object are separated. The dualistic research methodology of positivists -aimed at objectivity without interaction between subject and object- implies that researchers are not part of the systems which they investigate. The kind of knowledge aimed at in the positivist paradigm has been labelled 'spectator knowledge' by Maslow (1966). The epistemological position in the *constructivist* paradigm is that knowledge is socially and experientially constructed. The *relativist* epistemology of moderate constructivists assumes that multiple mental constructions exist. The inevitably partial perceptions of individuals result in multiple perspectives, and the ensuing inter-subjective realities are properties (interpretations) of the mind. Facts are not given phenomena, facts are made[2]. In the constructivist paradigm subject and object are interactively linked. It is a dualistic epistemology with interaction, resulting in experiential knowledge and, probably, more responsibility for the observed. I want to remark here that my use of the word *relativist* does not imply an extreme relativism: to my mind the multitude of inter-subjective constructions of knowledge are not all equally effective in coping with survival. Knowledge is effective action in the domain of existence (Maturana & Varela 1987), and different constructions of knowledge and reality might differ in their effectiveness to deal with the

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the continual embodiment of the organizational pattern of the system. This process of continual materialization is the link between pattern and structure. The abstract organizational pattern only becomes visible when it is embodied in a physical structure in the continual process of life.

In the positivist or 'representationistic' view knowledge is a representation of a pre-given reality, and knowledge is universal and objective (Vicari et al. 1996). The 'anti-representationistic' view is based on Maturana & Varela's autopoiesis theory: in this autopoietic view knowledge is creational, and developed "internally in a self-referential manner" (Von Krogh & Roos 1996a). In an autopoietic (self-reproductive) process cognitive systems are (re)created in a self-generating and autonomous manner (the term 'autopoiesis' stems from Greek: *auto*=self plus *poiein*=to make, produce, remake. See also footnote 1: chapter 3). Cognition is autopoietic, it is a creative act of bringing forth a world (Von Krogh et al. 1996). In this autopoietic view knowledge is history dependent and context sensitive, this is the constructivist perspective.

The key characteristic of an autopoietic system is that it continually undergoes structural changes without losing its web-like organizational pattern, its identity (Capra 1996:218). In the autopoiesis theory living systems interact with their environment through 'structural coupling': through repeated interactions which each lead to structural changes in the system. The nervous system of an organism, for example, changes its internal connections with each sensory perception. Living systems, however, are autonomous. The environment only initiates the structural changes; they are not determined or directed by the environment. Living organisms are structurally coupled to their environment, and continuously adapt, learn and develop. Living organisms do not react to environmental stimuli via linear chains of causes and effects, but they respond with structural changes in their non-linear, organizationally closed but structurally open, autopoietic networks (ibid.:267) (living systems are open to energy and matter flows, but they maintain a stable form through autonomous self-organization). The cognitive interaction of an organism with its environment is an intelligent interaction. Within the perspective of this so-called Santiago-theory intelligence manifests itself in the richness and flexibility of the structural coupling of an organism.

2. Latin: *facere, factus* = to make, made (Bos 1974:118).

vagaries of existence. People can *learn* to survive through experimental probing and adaptive responses to environmental feedback.

Methodology

The methodology of positivism is experimental testing, resulting in research findings that are objective, replicable and true. The empirical-analytical experimental methods are based on observation through the senses (‘the positives’). The positivist approach is by nature quantitative and reductionist, and mainly mono- and multi-disciplinary oriented[3]. Verification of knowledge takes place in a community of objective ‘spectators’. Scientific knowledge is considered to be a universal and context-free commodity.

An important constructivist-oriented methodology is dialectical debate in soft systems thinking, resulting in ‘more informed’ constructions. Key words are communication, interaction, negotiation, and facilitation of accommodation of different worldviews and interests (Leeuwis 1993; Engel 1995; Röling 1995; Hamilton 1995). Another constructivist-inspired methodology is the actor-oriented approach in the sociology of rural development, in which different groups of actors operate in ‘arenas of struggle’ (section 3.4). Generally speaking constructivist approaches are more qualitative, and tend more to holism and interdisciplinarity than positivist approaches. The multitude of actors include natural and social scientists, as well as other stakeholders in the rural development process. Verification of knowledge takes place in a community of intersubjective interpretors. The constructivist position is that all thinking is value-laden, and objectivity is replaced with intersubjectivity[4]. Knowledge can be tested intersubjectively among an appropriate group of peers, but first underlying worldviews need to be explicated.

Nature and role of science

In the positivist paradigm the natural sciences are the source of truth and innovation (Röling & Jiggins 1994). Applied science studies the consequences of human activity, and strives for impact through instrumentally manipulating causes. In the constructivist paradigm, however, the scientist is only one of the active partners in the social construction of reality, who studies human activity itself. The scientist is only one of multiple *situated agents* (Bebbington 1994). Scientists are facilitators of individual and joint learning who seek impact through communicatively influencing goals and reasons. Interaction is the source of truth and innovation. Röling (1995) speaks in this context of an interactive agricultural science, which is a hybrid of natural and social sciences. The shift from a

3. If interdisciplinary collaboration takes place in the positivist approach, it is between disciplines within the natural sciences. Interaction with the social sciences is minimal.

4. With reference to Guba & Lincoln (1989), Pretty (1994) remarks that conventional, positivist research uses the following four trustworthiness criteria: internal validity, external validity, reliability and objectivity. For more participatory systems of inquiry four alternative, but parallel, criteria were developed: credibility, transferability, dependability and confirmability. These alternative criteria, however, are still rooted in the positivist paradigm. Pretty (ibid.) presents a set of twelve criteria for enhancing trustworthiness or ‘authenticity’ that are not derived from the positivist paradigm, e.g., triangulation by multiple sources, methods and investigators, peer checking, participant checking, and impact on stakeholders’ capacity to know and act.

positivist to a constructivist perspective is expressed in the changing terminology of land use planning: one speaks today rather of land use *negotiation* than land use *planning* (Brinkman 1994).

Type of rationality

Habermas (1981a) distinguishes between instrumental, strategic, and communicative action (and rationality). In instrumental action one follows technical prescriptions in order to achieve previously defined goals. In strategic action other actors are recognized as equally strategic opponents who also try to realize specific goals (in instrumental action other actors are simply seen as 'objects' that follow some empirical laws and rules). In communicative action, finally, the actors aim at coordination of their activities through consensus on a common definition of the situation. In Habermas' concept of communicative rationality consensus is reached through argumentation in an 'ideal speech situation'. In such an 'ideal speech situation' undistorted communication can take place so that consensus is based on arguments, on dialectic debate, rather than on a strategic compromise (Leeuwis 1993:41; Hamilton 1995:168). Summarizing one can say that the objectives of instrumental, strategic and communicative action are respectively control, winning and consensus (Röling 1995).

In the positivist paradigm instrumental and strategic rationality play a role. Values and norms are kept outside the rational discussion (Röling & Jiggins 1994): a strict fact-value dualism prevails. One assumes that the goals are 'given' and focuses on the best technical means. In the constructivist paradigm, however, goals are the bone of contention and values and norms are the source of rational discussion. The advantage of a constructivist perspective is that it can constitute a common denominator to all three forms of rationality (Röling 1995). In land use *negotiation*, for example, instrumental, strategic and communicative rationality can play a role. Although all three forms of rationality play a role in contemporary agricultural science, instrumental rationality is hitherto the most dominant one. But also strategic rationality has assumed an important position in our society in the (past) era of unquestioned leadership of economic thinking (Röling & Jiggins 1994). Strategic rationality plays also a role in the social actor perspective in rural sociology, in which social actors try to realize their own objectives through the media power and money, negotiations and strategic coalitions (section 3.4). Communicative rationality is important in the development of sustainable agriculture, in which farmers are not only entrepreneurs but also natural resource managers. Collective learning of various actors (not only farmers) must take place in learning groups which aim at consensus through intersubjective reasoning. Communicative rationality emphasizes the logic of developing agency at higher levels of social aggregation. One can say that instrumental, strategic and communicative rationality is dominant in farming which is based on respectively the production, entrepreneurial and ecological imperative (ibid.). These rationalities and imperatives correspond with three different types of knowledge systems which underpin innovation in agriculture, i.e., transfer of technology, farm management development, and facilitating ecologically sound agriculture (Röling et al. 1997).

Type of system

In the positivist paradigm 'hard' systems thinking is central. For hard systems thinkers models are simplified representations of real world wholes. The aim of hard systems thinkers is to improve their knowledge about the world through improvement of models. In hard systems thinking goals are inherent to the system. Within the positivist paradigm with its realist ontology we can distinguish two different belief positions: holism and reductionism (Bawden 1995). Holism refers to the belief that the world is structured in the form of coherent whole entities (systems) with each subsystem, system and suprasystem having unique characteristics or emergent properties. These emergent properties are a key concept in systems thinking: it are properties which emerge at the system level and which cannot be fully understood or predicted by studying each component separately nor by simply taking the sum total of the properties of the components (Checkland 1981; Röling 1994b; Bawden 1995; Engel 1995). The whole is more than the sum of the parts - the basic tenet of holism. Since greater wholes have emergent properties "one must seek to understand the greater whole in order to understand its parts, not vice versa" (Savory 1991:30). Reductionism, on the other hand, refers to the belief that one must analyze and understand the parts in order to understand the whole. Conventional on-station research in East Africa operates within the reductionist perspective of the positivist paradigm, while most FSR attempts to operate within the holistic perspective of the same paradigm. However, the following three characteristics of systems -the coherence of wholeness, the emergence of properties, and systems dynamics- appear little in FSR studies (Bawden 1995) (respectively the operational problems 1, 9 and 10 in section 5.1)[5].

'Soft' systems thinking is based on a constructivist perspective -just as actor-oriented approaches are- but emphasizes a shared learning process towards negotiated agreement and concerted action. For soft systems thinkers models are constructs of reality within the participant's mind. Models are intellectual constructions, not would-be descriptions of reality (Checkland 1989). One has to keep in mind that there always will be a difference between (hard and soft) systems thinking about the world and the 'real world flux of interacting events and ideas'. The aim of soft systems thinkers is to improve human performance through debate and reflection, which requires systemic competence. In soft systems thinking goals and boundaries are permanently (re)negotiated. For natural resource management Röling (1994b) proposes a coupled system's approach comprising a 'hard' ecosystem and a 'soft' platform[6]. The ultimate objective of these platforms for negotiation and decision making is to reach *joint agency*, i.e., the ability to act as a group. "Soft systems only emerge when the actors comprising them actively operate as a system" (Röling et al. 1997). This participatory agency development on platforms should not only involve supporting institutions, but must stimulate, above all, systematic participation of the natural resource users themselves. Unfortunately, facilitation of the learning process of natural resource management by outside agents is not easy to organize.

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5. The link between the emergence of properties and operational problem number 9 (lack of sustainability) is that sustainability can be defined as the emergent property of a soft learning system, or a 'coupled system' (Röling 1994b;1995) (see next paragraph in the main text). "...sustainability needs not necessarily be defined only in terms of objective properties of a hard system, for example, the 'carrying capacity' of an ecosystem. It can also, and very usefully, be defined as the negotiated outcome of collective action of the human stakeholders in the ecosystem" (Röling et al. 1997).

6. Röling's coupled system's approach is inspired by Maturana & Varela's (1987) autopoiesis theory, in which living systems interact with their environment through 'structural coupling'. See footnote 1b.

"It requires skilled listening and asking questions, analytical capacities, a sensitivity to group processes and a capacity of synthesis, handling conflicts and fostering synergy, while knowing when to lead, when to wait, when to challenge, and when to withdraw" (Huijsman 1995; with reference to Campbell 1994).

In addition to hard and soft systems thinking, a third form emerged: critical systems thinking. In the critical systems approach the social (normative and political) dimensions of rationality get explicit attention. Critical systems thinkers question Habermas' concept of communicative rationality in an 'ideal speech situation', which is supposed to be free from communicative distortions. They scrutinize all ontological, epistemological, methodological and ethical assumptions, and contexts of power and communication. Bawden (1995) recommends for FSR a system of inquiry systems: three 'levels' or domains of inquiry, i.e., critical systemics, soft systemics and hard systemics. Hard systems methodologies are appropriate in the 'objective' world of developing improvements in the technical performance of 'hard' farming systems, soft systemics are appropriate for exploring 'human activity systems' in the 'soft' relativist world, and critical systemics are appropriate to investigate unequal distributions of power leading to distortions in communication. Hard systems approaches and reductionist methods can be used in constructivist approaches where they are appropriate. They should be developed, however, as 'tools to assist learning' rather than 'tools to teach' (Hamilton 1995:163). With the recent introduction of participatory methodologies -in which farmers and other stakeholders are active co-experimenters engaged in joint learning with facilitators- some FSR tends more towards soft systems approaches.

Role of extension

In the positivist paradigm, characterized by the Transfer-of-Technology (TOT) approach, data and information are transferred, while in the constructivist paradigm data and information are *shared* among various stakeholders. The first paradigm is typified by a 'do to' and 'do for' approach, while the second paradigm adheres to a 'do with' approach (section 5.1: operational problem 3). In the constructivist-oriented participative approach scientists and extensionists function as facilitators of information production and information sourcing. It is an andragogical approach in which the target group is involved in the *production* of information, and in which the process is more useful than the end product (Hamilton 1995:142). This andragogical approach is assisted learning, and is a powerful initiator of change[7]. Farmers are encouraged to become independent, self-directed learners, and the aim is the development of *higher quality collective agency* in order to solve environmental problems and other social dilemmas (Leeuwis 1993:56).

6.2 FSR at the point of overlap between positivist and constructivist paradigms

The FSR approach fits in with the historical and philosophical underpinnings of the development paradigm that guided during the last 40 to 50 years the way in which development was

7. Andragogy is the art and science of helping adults learn, and pedagogy is the art and science of teaching children (Hamilton 1995).

conceptualized, planned and implemented (Jamieson 1987). Two predecessor programs of FSR - community development and integrated rural development- suffered from the same internal contradiction as FSR: i.e., the dichotomy in theory and practice, the dilemma to strike a balance between a holistic and pragmatic approach (section 5.2). Past integrated rural development projects attempted to be so all-encompassing that they became unmanageable (Horwith et al. 1989). Conway (1985a) says the same about communal self-help projects, which he describes as exercises in social engineering. The persistent gap between FSR theory and practice, as exemplified in my work experiences (chapter 4) and in an extensive review of FSR literature (chapter 5), adds evidence to the suggestion that the FSR approach is a change in form, but not in content (Oasa 1985). The comparative analysis of my four work experiences indicates that in each case similar operational problems arise, which could be due to a faulty theoretical framework underlying FSR: the scientific paradigms at the root of FSR theory and practice might be inadequate.

In section 6.1 (*type of system*) I concluded that conventional on-station research operates from a reductionist position within the positivist paradigm, while *most* FSR attempts to operate from a holistic position within the same paradigm. With the recent incorporation of participatory research approaches in the original FSR methodology *some* FSR, however, moved towards the constructivist paradigm. Therefore contemporary FSR must be positioned somewhere at the point of overlap between the positivist and constructivist paradigms. Both the positivist ‘hard’ systems thinking and the (still novel) constructivist-inspired ‘soft’ systems thinking in FSR face serious operational problems (sections 4.5, 5.2): the systemic competence of researchers remains a constraining factor. It seems as if in resource-poor farming there is no simple ‘techno-fix’ nor a simple ‘participation-fix’ (Scoones & Thompson 1994). The gradual shift from the positivist to the constructivist paradigm is, however, a positive development in FSR. Paradigm shifts are not a matter of replacement, but of addition and extension. The prevailing paradigm becomes a subset of the new one (Röling 1995). Perhaps a merging of ‘hard’ systems research and ‘soft’ social actor approaches can constitute a new paradigm for agricultural R&D (Huijsman & Budelman 1996). This, however, involves methodological complexity, interdisciplinary communication barriers, skill requirements, and organizational and managerial consequences - i.e., a need for improvement of human capability (section 5.2).

The recent attempt to integrate positivist and constructivist approaches in FSR practice proves troublesome. Especially the FSRT-WP case in Zambia (section 4.4) shows that, despite the presence of two rural sociologists in the team and the participatory working with Farmer Research Groups, the more constructivist-oriented methodologies are not easily incorporated in the largely positivist-oriented FSR practice. The four main issues -holism, interdisciplinarity, attitudinal factors, and lack of countervailing power- remain problematic. In my view the integration of the positivist and constructivist paradigms is hampered by the ontological, epistemological, and methodological differences between the two paradigms (Table 8). These differences cause the frequently arduous collaboration between natural and social scientists. Later on I will argue that the transcendentalist paradigm facilitates the integration of the previous two paradigms: in a way it encompasses the ontologies, epistemologies and methodologies of the positivist and constructivist paradigms. In the remaining part of this section I will elaborate on the constructivist paradigm in order to elucidate its possibilities and shortcomings, resulting in the conclusion that an extension of prevailing paradigms is necessary.

Starting with the positivist paradigm, it is evident that this paradigm is inconsistent: its ontology is materialistic-reductionistic *monism*, while its epistemology is ‘objective’ *dualism*, with a separated subject and object. This epistemology undermines the positivist ontological presupposition of one undivided, materialistic world (Van Dongen 1996). Most constructivists, on the other hand, side-step the ontological question, and get entangled in different degrees of relativism. Nevertheless, the constructivist paradigm is better suited to describe the day-to-day practices of a multitude of actors participating in a multi-dimensional rural development process. The multitude of actors include various categories of farmers, extensionists, on-station researchers, FSR practitioners, facilitators, input-suppliers, marketing organizations, private traders, financing agencies, government planners, NGO staff, politicians, and donor agencies. In order to develop sustainable farming systems all these actors must be involved in a collective learning process leading to joint agency (section 6.1: *type of rationality*). This ability to create effective collective agency -the ability to act as a like-minded group- is in East Africa (and probably in many other places) insufficiently developed (otherwise the problem of sustainable rural development would not exist). The question is under which specific conditions collective agency emerges.

Social dilemmas, such as environmental degradation and sustainable rural development, require the emergence of collective agency. Social dilemmas are defined as conflicts between individual and collective interests “in which it is rational for people to make selfish choices although it were better for everybody if all made co-operative choices” (Röling et al. 1997). In order to learn to manage eco-system feedback, i.e., the negative collective effect of individual selfish choices, facilitation of *social learning* to take effective collectice action to overcome social dilemmas is required. With reference to Parson & Clark (1995), Röling et al. (1997) define social learning as:

> “The ability inter-subjectively and through interaction to construct shared knowledge, and to agree to act, actually to act, and to monitor effects of acting upon that knowledge, at a level of social aggregation commensurate with the system level perceived to require collective action. Social learning therefore involves knowledge for the adaptive management of the bio-physical environment, and knowledge for the participatory management of social process”.

The most difficult part of social learning is to define the desirable ‘soft’ and ‘hard’ future as perceived by different actors/stakeholders. Holistic resource management depends on well-formulated goals (Savory 1991:456), but the process of setting goals has proven itself the hardest part[8]. One might argue that only under conditions of high population pressure and serious land degradation people will start looking for alternatives to current land use, and only then group synergy will emerge. It would be unfortunate, however, when only with a certain threshold of misery being surpassed people would be inclined to collaborate. Environmental degradation could then only be addressed when much damage has already occurred, and costs of regeneration will be high. With regard to environmental degradation it is ultimately in each individual’s interest to collaborate, but people might not realize this (and act upon it) until situations are critically dangerous. In this context the distinction between reactive and pro-active change is useful (reactive and pro-active change are related to Zweers’ aposteriori- and apriori-willingness to act: section 3.3). Although both

8. Savory (1991:55) speaks of “an ingrained human proclivity for acting without clearly defined goals, or worse, simply reacting to events and reaching for a quick fix”. In his ‘Holistic Resource Management’ model he emphasizes the importance of defining a goal in three parts: i.e., quality of life, production, and landscape.

mechanisms deserve attention, I emphasize the importance of pro-active change. To explain retrospectively how people responded to adverse environmental conditions is useful, but to understand prospectively how sustainable development can be realized seems more efficient in terms of the production factors land, labor and capital. According to Savory (ibid.:407) we have to replace the binding force of catastrophe (e.g., severe land degradation) with a shared vision and goal: a vision beyond ourselves. But then again, this is easier said than done.

Whilst we have to give due recognition to the achievements of the constructivist paradigm, in that it provides a new conceptual foundation for the engagement of resource-poor farmers in participatory processes and in 'arenas of struggle', we also have to draw lessons from its shortcomings. Playing the devil's advocate with the purpose to clarify the weak dimensions of the paradigm, I conclude that the operationalization of the constructivist-inspired soft sytems approach poses some serious problems[9]. I call into question its effectiveness in two main areas: 1) the construction of 'ideal speech situations' and 2) the number and quality of facilitators needed (in section 10.6 more problematic issues in the soft systems approach will be discussed). With regard to the first issue, I must remark that the emphasis on communicative rationality in an 'ideal speech situation' does not correspond with my work experiences as described in chapter 4. I agree with critical systems thinkers that such situations are more often than not an illusion. In critical systems thinking one argues that power structures affect the dialectical debate in such a way that a truly open debate cannot be realized (Jackson 1985)[10]. My earlier assumption that most actors have 'hidden agendas' (section 1.4) is supported by Scoones & Thompson (1994), who remark that "misunderstanding and apprehension over hidden agendas and manoeuvres for power are the rule, not the exception". In addition to 'hidden agendas', they speak also of 'hidden transcripts'. This concept of Scott (1990) refers to interactions between people of different social groups (for example, between resource-poor farmers and scientists) in which a portion of the subordinate's opinions, beliefs, ideas and values are driven underground for reasons of repression, fear and suspicion. This conforms with my experience that in power-laden situations farmers often do not express what they really think. Especially in the presence of government-employed officials (such as research and extension officers), farmers tend to stick to the official version of extension recommendations. They tell you what they think you want to hear. Under more 'relaxed' conditions stories frequently change considerably. It is evident that the contrasting -sometimes conflicting- goals and interests, and contending worldviews of internal and external actors in the rural development process cannot always be mended.

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9. Say Röling et al. (1997): "Of course, it is entirely possible that also collective action and social learning cannot overcome the momentum of our focus on self-interest, comfort, income and economic growth and hence cannot prevent the collapse of our post-industrial society. The 'green history of the earth' shows that optimism with respect to our ability to overcome social dilemmas would be entirely misplaced".

10. Röling et al. (1997) say that facilitation of social learning is an intervention which pertains to "the paradoxical profession of intervening for non-coercive change". Although attempts to improve the effectiveness of interventions for non-coercive change are inevitably marked by a naive optimism, Röling et al. are aware of theories of power, which could explain why their approach might not work. For the time being, however, they are more interested in theories of learning than in theories of power. According to Röling (personal communication) one has to make a distinction between: 1) why things do not work, and 2) why things could potentially work. I also am mainly interested in the conditions under which collective agency emerges, but nevertheless power structures are an important component of these conditions. Later on I will argue that the concept 'collective consciousness' deals effectively with the concept 'power'.

In soft systems approaches the aim of most stakeholders, including facilitators according to Leeuwis (1993:41), remains to maximize their own interests in the negotiation process.

> “Implicit to the soft systems approach is the rather optimistic and naive assumption that the ‘collective learning process’ takes place in a very open and eventually harmonic atmosphere (ibid.:40). ... It seems highly unrealistic that an ‘independent’ facilitator (or anyone else) could in practice create an ‘ideal speech situation’, and/or convince actors to set aside their personal or institutional interests. ... In all, communicative rationality emerges as a highly utopian notion.. ... Too many participatory procedures have -in practice- turned out to be ritual facades in which very little real opportunities existed to influence the course of events. Thus, at best Habermas’ notion may help extension agents to create *effective* higher quality collective agency in some cases, but in many contexts it may not, and in the latter Habermas’ approach has little to offer to extension agents” (ibid.:98).

Differing interests and differential access to resources (including knowledge) are unavoidable, especially in social settings with a wide array of actors. Thus, it seems important to choose the boundaries of soft systems not too wide. When actors with too widely diverging goals, interests and convictions are included in the negotiations, then efforts to develop effective collective agency may have counter-productive consequences (Leeuwis 1993:383, 408). The danger is that with a wide array of actors the negotiated ‘consensus’ amounts to a strategically maintained ‘lip-service’ only (ibid.:383). The rational consensus is then not based on a truly dialectic debate, but becomes a strategic compromise. Rational argumentation on normative questions is possible, but there is no guarantee that consensus will be reached (Pijnenburg 1995; Hamilton 1995:155). One can argue that in East Africa the traditional ‘palaver’ is a kind of dialectic debate aiming at negotiated consensus. The question whether such ‘palavers’ are (still) effective in the rapidly changing African society (increasing individualization, dwindling authority of village elders, more inter-generational conflicts) would require further study. My work experiences confirm that in meetings with researchers, extensionists and other actors in the rural development process ‘strategically maintained lip-service’ is a common phenomenon (section 4.4.6) (it is obvious that the frequently hierarchic relationships in research and extension organizations do not contribute to an ‘ideal speech situation’, and that low salaries tend to promote ‘lip-service’).

With regard to the second issue -the number and quality of facilitators needed- I maintain some justifiable scepticism as to the soft systems approach. When the formation of joint agency requires “the participation of outsiders to help create momentum” (Huijsman & Budelman 1996), then large numbers of skilled facilitators, who are a rare breed in themselves, are needed. I certainly believe that participatory approaches stand a greater chance than TOT-based approaches to develop information that is “internalised by the participating farmers as personal constructs” (Hamilton 1995:104). Successful examples of farmer learning in experimenting groups and platform processes dealing with common property resources management, exist (see footnotes 16 & 17 in chapter 11 for references). Nevertheless, I maintain that it will be difficult to engage large groups of resource-poor farmers in participatory learning processes. Especially in East Africa with a low population density, large distances, an inadequate infrastructure and a hitherto non-participative, formal education and training culture, this will be difficult to realize. Although some examples of successful responses of African farmers to demographic pressure, without much outside intervention, exist (Box 15), it is likely that outsider-facilitators have a role to play in the sustainable development of East Africa’s vast spaces.

Box 15: Farmers' responses to demographic pressure.
In a study of Machakos District in Kenya, covering the period 1930-1990, more people resulted in more output per head and per km^2, and less erosion (Tiffen et al. 1994). In Machakos rapid population growth did not lead to environmental degradation, and the adaptive capability of the local people was large. The so-called Boserup (1965) effect suggests that population growth contributes to the generation of new technologies, and leads to cheaper transport, easier marketing, and more specialization (Tiffen et al. 1994). The relatively supportive policy environment provided by Kenya was an important factor in the Machakos District experience.

The Adja farmers in Benin developed an oil palm-based agroforestry system, which broadly relieves the problems imposed by increasing population pressure and declining soil fertility (Brouwers 1993).

It is evident that the quality of participatory approaches depends heavily on the quality of the facilitators: communication professionals with both research and facilitation skills are needed (Engel 1995:252-53). For technical scientists the simultaneous role of technical expert *and* facilitator is difficult (Hamilton 1995:157). According to Engel (1995:269) intuition, knowledge, ability and context go hand in hand to produce an 'effective innovation networker'. A large part of what successful networkers do is 'playing around' (ibid.:270). These references to 'intuition' and 'playing around' indicate in my view that the ability to facilitate collective learning shows characteristics of an 'art': it is not a skill that can be acquired outright. The aim of facilitators is "to develop a shared sense of direction among all the relevant actors" -to foster group synergy- but "the art of fostering group synergy is delicate" and demands empathy with the target stakeholders (Campbell 1996). Moreover, the role of facilitators as 'bureaucracy busters' (Carr 1994) is value-laden and political, and requires a fine understanding of power.

> "Being a successful facilitator often means being able to bring about changes in attitudes, processes and organizational cultures within the employing institution" (Campbell 1996).

One can wonder where the large number of facilitators needed will come from and who will train them? (Huijsman 1995). Perhaps the analytical perspective presented in chapter 3 (Diagram 5) can provide clues on how to deal with changes in attitudes and organizational cultures. The first criterion used to characterize the various paradigms -ontology- can be related to the main issue 'attitudinal factors' in the sense that a certain ontological position implies a worldview and a specific attitude towards the world. While the positivist attitude is that the world can be 'engineered', the constructivist attitude is that the world can be 'discussed'. Both the positivist and constructivist attitudes are based on the discursive and practical consciousness (Diagram 5: chapter 3). In my judgement a dimension that seems to be overlooked in both paradigms must be added: the possibility of the lower route in Diagram 5 - the possibility of a basic attitude based on internal norms and values. For the time being we conclude that a merging of 'hard' and 'soft' systems thinking (and actor-oriented approaches) might be beneficial, but increases demands on agricultural researchers who need to obtain new skills.

6.3 The scientization process

The characterization and explicitation of scientific paradigms, as presented in this chapter, bears relevance to the topic of FSR in East Africa, first because a better understanding of the four main issues selected at the end of chapter 5 may be gained, and secondly because worldwide a scientization of agriculture takes place. I argue that FSR, insofar as it is operating under the positivist paradigm, is part and parcel of this scientization process. Scientization is the systematic and continuous reorganization of agricultural practice to the image developed in and through agricultural science (Van der Ploeg 1987:1). As a consequence of scientization, local knowledge systems (*l'art de la localité*) are replaced by scientific knowledge. This process of scientization has been very successful in north-western Europe, but also led to persistent problems: environmental pollution, over-production, decreasing agricultural employment opportunities, disrespect for the intrinsic value of animals, negative consequences of the western agricultural system for LICs, and a continuing simultaneous occurrence of hunger in LICs and food surpluses in the West. The enormous increases in agricultural productivity in the West, and the attending serious problems, are due to a rather simple and narrow concept of rationality based on economic efficiency: i.e., improvement of input/output relations, measured in money (instrumental and strategic rationality) (Van Hengel 1995a). Until recently, most agricultural scientists had no eye for the imperfections of the scientization process, in which disadvantages of agricultural modernization are externalized. Environmental costs, for example, are externalized: they are not included in the production costs of agricultural produce. In order to solve the persistent problems a critical reflection on the process of scientization is necessary.

It is typical of the positivist paradigm that the multiplicity of problems, caused by the process of scientization, become starting point and legitimization for a continuing scientization (Van der Ploeg 1987:303). The general assumption is that agricultural modernization in LICs has to, and can, follow the same track as in north-western Europe (ibid.). The stagnation in agricultural development in Africa is contributed to the fact that scientization of agriculture in that part of the world has not (yet) been carried through to the extent required. This would explain the stagnation, and at the same time indicate the solution: 'more of the same' (ibid.:8). Since the FSR approach has been introduced mainly from North America and Europe, it largely reflects Western values, beliefs and expectations (Wilson et al. 1986). The development of FSR in East Africa has been initiated and stimulated by the CGIAR network (especially CIMMYT). In this network the *universal* design capacity of positivist science is an implicitly accepted presupposition, which has been transferred to NARS in East Africa and elsewhere. Until today the CGIAR centres predominantly propagate the positivist Transfer-of-Technology paradigm (Pretty & Chambers 1994). The interest in local knowledge systems is on the increase since the eighties (section 5.1: operational problem 5), but real acceptance of farmers' knowledge *and* underlying conceptions of reality implies that the claim of science on universally valid knowledge must be left behind (Brouwer 1990). In most cases, however, farmers' knowledge is taken seriously *only* when it can be translated in scientific terminology (Scoones & Thompson 1994). Because the validity of farmers' knowledge is tested against the possibility to translate it in scientific theories, the validity of science becomes more and more absolutized. In this way the interest of western trained scientists in farmers' knowledge will in the end contribute to the destruction of local knowledge systems, and to a continuing scientization of agriculture (Brouwer 1990).

It is obvious that scientization *in Western terms* is not a true form of legitimization of local knowledge (Thrupp 1989; Huijsman & Budelman 1996). Indigenous knowledge and local experimentation by farmers must be valued on their *own* terms. After all, “research is only a formal procedure for what is normal human behavior” (Röling 1988:184). Many farmers are experimenting in order to achieve their objectives, but this informal, valuable research by farmers is seldom explicitly incorporated into FSR programs (Ashby 1986). Most farmers do not ‘adopt’ recommended technologies but ‘adapt’ them to fit their specific needs (Horton 1984; CIMMYT 1987). Only the farmer can carry out the final optimisation (Conway 1985a). Especially in rainfed farming systems the fine-tuning of recommendatons -the adaptive management- should be left to farmers and extension workers (Stoop 1987b): agriculture, including farmers’ experimentation, is a seasonal adaptive performance (Richards 1989) (section 5.1: operational problem 10).

Although farmers are the final judges as to the appropriateness of technology, and scientific evaluations remain at the level of hypothesis until the point of acceptance or rejection by farmers (Rhoades & Booth 1982), many scientists find it difficult to accept farmers’ experimentation[11]. Nevertheless, interaction between local and scientific knowledge systems must be the starting point of research programs (Van der Ploeg 1987; Box 1988). In order to facilitate interaction on these ‘battlefields of knowledge’ (Long & Long 1992), it might help to point out to scientists that in farmers’ experimentation -just as in formal research- idiosyncracy is controlled by peer review. Moreover, this is done “in as rigorous a fashion as it could be” since farmers’ survival may depend on it (Jiggins 1994b).

6.4 Conclusion

The conclusion is that we learned about F: the (implicit) frameworks of ideas and concepts underlying FSR theory and methodology have been made explicit (which is hardly ever done in FSR literature). In Table 8 a systematic comparison of the positivist and constructivist paradigms is presented. In order to be able to close the gap between FSR theory and practice, the four main issues selected must be subjected to scientific scrutiny. The explicitation of underlying paradigms in this chapter contributes to a better understanding of the problematic nature of these issues. The important question in FSR is how a *simultaneously* holistic and pragmatic approach can be developed. A holistic *and* pragmatic approach demands *systemic competence* and *high quality collective agency* with the actors in the rural development process. However, the ‘*art of fostering group synergy*’ is delicate and intangible. In order to create joint agency on higher levels of social aggregation than at farm level, large numbers of competent facilitators are needed. Their numbers, however, are small, and hitherto it is not clear whether, and how, large numbers of skilled facilitators can be trained. The discussion in section 6.2 revealed that both the positivist and constructivist paradigm face difficulty in dealing with above mentioned topics. The notion of a collective learning process, based on communicative rationality in an ideal speech situation, was labelled ‘naive’ and ‘highly utopian’ for many contexts by Leeuwis. I will further problematize soft systems thinking in

11. See footnote 41: chapter 4.

later chapters (especially chapter 10). In order to elaborate more on the first main issue -holism- we will in the next chapter discuss the concept holism insofar as relevant to agricultural science.

7 ABOUT HOLISM

7.1 Philosophical knots

Scientific paradigms include *beliefs* in certain ontologies or reality-models, which need to be explicated if meaningful discourse is to take place (as was done in chapter 6: Table 8). Tarnas (1993:369) speaks of the conventional scientific view of reality as a 'monotheism' in new clothes. Notwithstanding the widespread belief in the reductionist scientific method, it is evident that a wide range of problems in the 'real world' are beyond the grasp of a complete scientific analysis (Chalmers 1990:124; Funtowicz & Ravetz 1994). The starting-point for a holistic ecology must be that nature is always more complex than we, to our best understanding, can know and that changes in our association with nature always will have unpredictable consequences (Schroevers 1984:66). This is in line with the observation that from a holistic perspective 'surprise is anticipated, but never predictable' (Bawden 1995; section 6.1: *type of system*). The hitherto disappointing impact of agricultural science on farming systems of resource-poor farmers indicates that the reductionist scientific method has not been very effective in improving these farming systems. The long list of operational problems in chapter 5 points to a similar bleak conclusion for FSR. Our scientific methods fail to solve burning problems of resource-poor farmers[1]. Apparently modifications are required.

Through the process of 'scientization' science became an enormous power in our society, but what justifications can be given to our current notion of what science is? Why, for example, must science conform to the requirements of scientific rationality? Just as any other belief, *the belief* in scientific rationality should be open to discussion (Koningsveld 1976:89). According to Popper (1974) the belief in the authority of science and in scientific certainty is 'wishful thinking': science is fallible, because science is the work of people (Van den Belt 1995b). Each scientist, whether believer in the positivist, constructivist or transcendentalist scientific paradigm, must confront the question of justification. Points of departure, such as the belief in instrumental and strategic rationality, need to be discussed. One cannot proceed without initial assumptions (Baer 1989: section 1.4) and scientific rationality cannot be defended on scientific grounds (Koningsveld 1976:84; Giddens 1976:section 3.1; Tarnas 1993:chapter 6, Introduction).

The specialist sciences became in the last centuries activities that are independent from philosophy by the cutting of some 'philosophical knots' (Koningsveld 1976:27). Philosophical knots have been cut, for example, in relation to the subject-object dualism. The cutting of such knots, unavoidably, implicates certain philosophical positions, and these positions constitute the -mostly unconscious- presuppositions of the current specialist sciences (ibid.:23). Koningsveld (ibid.:86) wonders whether we should not go back to these philosophical knots of the past in order to 'cut' or 'solve' these knots in a different way, so that we become able to deal with our present practical problems. In other words, do we need to untie these knots in order to develop an alternative paradigm that may adequately solve our problems? After all, the independence or freedom of science takes shape in the critical reformulation, or different interpretation, of practical problems

1. I want to acknowledge here that 'Green Revolution' technologies prevented widespread famine in some (relatively well-endowed) parts of Asia, and that positivist-oriented industrial agriculture raised incomes of farmers in high-income countries.

(Koningsveld 1987c). The philosophical knots that have been cut, the implicit premises, constitute the metaphysical part of scientific paradigms. Because of the cutting of these knots, one does not feel the need anymore to discuss such points of departure (Nagel 1989). The nagging question of the dualism of subject versus object, for instance, has not been answered by positivist science, it was simply side-stepped (Wilber 1977:33). The ensuing dualistic knowledge is "at once the brilliance and the blind-spot of science and philosophy" (ibid.:41). Modern positivist science provides highly sophisticated and detailed maps of the world, but they remain maps since *the map is not the territory*. With the aid of computer programs one can design sophisticated maps and models of the world, but the position of the subject in the world and the relation subject-object remain blind-spots (the inconsistency between ontology and epistemology in the positivist paradigm: section 6.2)[2]. A new paradigm has *raison d'être* when it enables a more adequate formulation of problems, and provides a perspective on possible strategies to overcome these problems (Schakel 1987). Such a reformulation of problems might imply a stepping out of the conventional scientific paradigm: it might be necessary to break the chains of the powerful positivist-reductionist paradigm. The positivist, and in my view also the constructivist paradigm, require extension, but without rejecting their beneficial characteristics, which prove useful in certain specific conditions.

7.2 Holistic philosophies

Various philosophies of nature can be distinguished (Allen 1978;Sheldrake 1989; Vanheste 1996) (Table 9). In the *mechanistic-reductionist* philosophy of nature living organisms are regarded as inanimate machines: all phenomena of life can ultimately be understood in terms of physics and chemistry (Capra 1996:87). Its ontology is materialistic monism (Table 8: chapter 6), and emergent properties do not exist. The ontology of the *holistic-materialistic* philosophy of nature is also materialistic monism, but in this view of nature emergent properties do play a role: properties which only emerge when components of a system interact (Vanheste 1996). The whole is more than the sum of the parts, because of the synergetic effect of interactions. These first two philosophies of nature belong to the positivist paradigm. The third philosophy of nature in Table 9 - *vitalism*- is characterized by a sharp distinction between non-living things and living organisms: plants and animals possess inherent organizing principles (a vital factor, a formative impulse, or entelechy) (Sheldrake 1989:69). In the *holistic-organismic* philosophy of nature (the philosophy of organism), finally, living organisms are not regarded as inanimate machines, but as what they *are*: 'living organisms'. *And* also physical and chemical systems (molecules, crystals, etc.) are regarded as in some sense living: they are 'structures of activity' or organisms (ibid.:94). In organismic philosophy there is no sharp distinction between the inanimate realm and the realm of life: *all* nature is alive. The organizing principles of living organisms are not different in kind, only in degree, from the organizing principles of molecules (I will return to this somehow ambiguous statement in section 8.4: see especially footnote 24 there). According to the philosopher Whitehead, biology studies larger organisms whereas physics studies smaller organisms (ibid.:55). The organismic philosophy of nature is more radical than vitalism: it sees organisms at all levels of complexity as alive (from

2. In the view of Maturana & Varela (1987) there is no territory from which we make a map: the making of the map produces the territory (see footnote 1b, chapter 6).

subatomic particles to the entire cosmos). The non-material organizing principles that used to be attributed to souls (Aristotle) and vital factors (vitalism) are now thought of in terms of 'systems properties' or 'emergent principles of organization' or 'patterns which connect' or 'organizing fields' (ibid.:54). The question remains *what* these *elusive* (ibid.:55) principles of organization exactly are (we will come back to this question in chapter 9)[3]. Here I just want to remark that in ecological agriculture the phenomenon 'life' is considered to be an entity in itself with an autonomous, intrinsic value (Goewie 1993; section 1.4). In the Gaia hypothesis (Lovelock 1979;Margulis 1995) life itself creates the conditions for its own existence. The regulation of, for example, the earth's temperature and atmospheric composition are in this theory emergent properties of the system 'earth', which

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3. Allen (1978) describes holistic materialism as the third route which characterizes mainstream biology since the thirties, a third route which circumvents both mechanistic reductionism and vitalism (Vanheste 1996). According to Vanheste (1996), Sheldrake (1989) ignores and overlooks this philosophy of nature: in Sheldrake's view, says Vanheste, contemporary biology is dominated by the mechanistic-reductionist view. Sheldrake (1989:69,87), in turn, argues that vitalism continues to exert a strong, albeit often unconscious, influence on contemporary biology: the role of the vital factor has been taken over by genetic programs and genes. "The central paradigm of modern biology has in effect become a kind of genetic vitalism" (ibid.:83). And to make it even more complicated, Capra (1996:36) argues that Sheldrake's theory of 'morphogenetic fields' is a subtle version of vitalism.

In Capra's view (ibid.:35) vitalist and organismic biologists have different answers on the question in which sense 'the whole is more than the sum of its parts'. Vitalists argue that a non-physical entity must be added to the laws of physics and chemistry in order to understand life. Their 'entelechy' is a separated entity which influences physical systems without being part of it. In the organismic philosophy of nature such a detached, non-physical entity is not deemed necessary in order to understand life. Organismic biologists argue that the extra ingredient needed is insight in 'organizing patterns', which are inherent to the physical structure of organisms. In contemporary theories on living systems insight in the pattern of 'self-organization' is crucial (ibid.).

In Maturana & Varela's (1987) autopoiesis theory (footnote 1b: chapter 6) self-organization distinguishes living systems from all others (Capra 1996:103). Maturana & Varela characterize their theory as 'mechanistic' in order to distinguish it from vitalism. The characterization of living systems through the concept autopoiesis does not provide information on the physical nature of the parts of the system. The abstract description of the organizational pattern must be complemented with a description of the structure of the system in the language of physics and chemistry. Capra (ibid.:105) proposes to integrate structure-oriented models of self-organization (e.g., Prigogine) and pattern-oriented models of self-organization (e.g., Maturana & Varela) in a comprehensive theory on living systems. Eco-systems can then be described as autopoietic networks and as dissipative structures, which are intelligent because of the cognitive dimensions that are inherent to the process of life (Capra 1996:296,297). In the end all living beings are composed of atoms and molecules, but they are not 'nothing than' atoms and molecules. Only the non-material and irreducible organizational pattern makes them alive (ibid.:87). When an organism is dissected, this pattern is lost. Most reductionist researchers do not grasp the importance of pattern (ibid.).

Above paragraphs make clear that it is not easy to determine the exact place of the theories of Sheldrake, Capra, and Maturana & Varela in Table 9. Nevertheless, these still new, emerging theories of biology might in the near future prove to be important for the development of a sustainable agriculture. To my mind it is critical that researchers maintain a willingness to explore alternate theories and approaches. The question is how to reduce complexity to manageable proportions without ending up in a uni-dimensional, positivist rationalization, which violates multiple cause/multiple effect relationships in ecosystems. In an attempt to formulate a tentative answer I will hypothesize in the coming chapters that when the transcendentalist paradigm is brought to bear on the 'manageability' of complex situations, the -far too narrow- positivist and constructivist views of human agency can be extended.

emerge -automatically and without any teleological plan- as a consequence of cyclical feedback mechanisms between organisms and their environment (Capra 1996:113)[4].

Table 9: Philosophies of nature

Various philosophies of nature	Ontology	Emergent properties
mechanistic-reductionist materialism	materialistic monism	no
holistic materialism	materialistic monism	yes
vitalism	sharp distinction between non-living things and living organisms: dualism	yes: in living organisms
holistic-organismic philosophy	no sharp distinction between non-living things and living organisms: 'organismic' monism	yes

In section 6.1 (*type of system*) I argued that we have to distinguish between the use of the word 'system' as an abstract construct and as a reference to some part of the real world. In the latter case 'systems' or 'organisms' are ontological entities. Koestler (1989:48) speaks of the relativity and ambiguity of the terms 'part' and whole', and introduces the concept 'holon': a whole that can also be part of a larger whole.

> "...wholes and parts in [an] absolute sense do not exist anywhere, either in the domain of living organisms or of social organizations. What we find are intermediary structures on a series of levels in ascending order of complexity, each of which has two faces looking in opposite directions: the face turned towards the lower levels is that of an autonomous whole, the one turned upward that of a dependent part" (Koestler 1968:197).

The intermediary structures or sub-wholes are wholes in their own right but also parts of larger units. These 'Janus-faced sub-assemblies' or 'holons' (derived from the Greek *holos* = whole, with the suffix *on* to suggest a part) are a fundamental characteristic of all types of hierarchies. Holons are organized in multi-levelled 'nested' hierarchies or 'holarchies'. Nested means that higer-level wholes are made up of parts, which are themselves wholes at a lower level, containing lower-level holons, and so on. Living organisms show such a hierarchical arrangement, with groups containing individual

4. Many scientists reject(ed) the Gaia hypothesis, because of its assumed teleological character. Although Lovelock and Margulis never suggested that planetary selfregulation was teleological, most mechanistic-reductionist biologists could not envision how life creates its own conditions without being conscious and goal-oriented (Capra 1996:112). The newly emerging theory on living systems, as described by Capra (1996), claims to end the longstanding debate between mechanicism and vitalism, and between determinism and freedom. In this theory living nature is seen as intelligent without the necessity to postulate an all-encompassing design or goal. The behavior of living organisms is intelligent because of the 'structural coupling' between organisms and environment (ibid.:219) (footnote 1b:chapter 6), and it is determined as well as free. The behavior is not determined by forces from outside (as in vitalism), but by the structure of the organism itself. Its history of structural coupling, its history of structural changes, determines which new roads are becoming available through interactions with the environment, but which road the system chooses remains unpredictable (ibid.:220).

members, containing organs, containing tissues, containing cells, and so forth. Or subatomic particles in atoms, in molecules, in crystals (Sheldrake 1989:369). The organismic approach is not reductionist, since it does not attempt to explain properties of larger organisms in terms of properties of their parts. In the philosophy of organism parts of organisms can be understood only in relation to their activities and functions in the whole (ibid.:372). At each level the whole is more than the sum of the parts: “organisms behave as wholes, with an organic unity that is irreducible” (ibid.:95)[5]. Because of this irreducible integrity living organisms can no longer be forced into the positivist, mechanistic metaphor of the inanimate machine. Positivist researchers do not speak about farms as ‘organisms’ but use the word ‘systems’, which is “a technical reference to the complexity of a biological whole” (Koepf 1989). Component subsystems differ from each other, but the whole entity displays oneness (coherence) and uniqueness. One of the pioneers of systems thinking, Bertalanffy, speaks of ‘a glorious unity of difference’ (in:Bawden 1995).

Checkland & Scholes (1990:22) adopt in their ‘soft sytems’ approach the term ‘holon’ to refer to constructed abstract wholes. Engel (1995), however, does not adopt this term to refer to mental constructs, because in his view Koestler uses the concept holon in a more ontological sense. To my mind the concept holon must be seen as an abstract construct, which -depending on the way you look at it- constitutes a whole *and/or* a part. Koestler (1968) refers to the tension between the individual autonomy of parts and the constraints imposed by the whole, but these constraints leave room for flexible strategies, i.e., room for manoeuvre (section 3.4)[6]. Moreover, actors actively participate in contextualizing, interpreting and creating these constraints (Engel 1995:43). This room for manoeuvre contributes to the *elusive* character of the concepts ‘whole’ and ‘part’. In Koestler’s (1989:49) view the holon symbolises the missing link between holism and reductionism. Both the holistic and reductionist approach are one-sided, since ‘whole’ and ‘part’ are treated as absolutes: “both failed to take into account the hierarchic scaffolding of intermediate structures or sub-wholes” (ibid.)[7].

According to Schroevers (1984:51) the holistic argument that ‘the whole is more than the sum of its parts’ can be a source of mystification. The emerging synergetic effect of interaction can be puzzling, mysterious, or even mystical[8]. Schiere (1995:26) remarks that the word holism does not

5. This irreducible organic unity refers, in my view, to Maturana & Varela’s (1987) abstract, web-like organizational pattern, to the identity, to the autonomous self-organization of living organisms (footnote 1b: chapter 6).

6. This room for flexible strategies is in agreement with the richness and flexibility of the structural coupling of autonomous organisms (footnote 4 here; footnote 1b in chapter 6).

7. According to Capra (1996:38) the use of the term multi-levelled ‘hierarchies’ in organismic biology can be misleading, because of its connotation to human hierarchies characterized by authority and control. The multi-layered order in nature -the systems within systems- is better described by the concept ‘network’ or ‘the web of life’. The web of life consists of networks of networks. Each knot in a network represents a smaller network. Hierarchic schemes are human projection. In nature hierarchies do not exist: there is no such thing as ‘higher’ or ‘lower’ in nature. Only networks, which are part of other networks, exist (ibid.:45). Savory (1991:499) remarks: “Our language itself reflects mechanistic logic and thus hinders holistic thought. ... The term ecosystem implies an entity distinct from us as humans, and to say we are part of it raises a second problem. Part is a mechanical term, while in the natural world there are no parts, only wholes within wholes”.

8. Capra (1996:38) gives the simple example of the taste of sugar. The emergent property ‘taste of sugar’ is lacking in the carbon-, hydrogen- and oxygen-atoms which constitute sugar. At the same time it is impossible to explain to a person what the taste of sugar is without having him/her actually tasting it. Even if we know how the

necessarily imply a mystical sense, but he simultaneously speaks of the deeper sense of the word 'system' as a unit, i.e., an 'organism' with an irreducible integrity (ibid.:32). The agronomic principle of input interaction can serve as a practical example of a synergetic effect: the combined effect on yield of applying several inputs jointly is greater than the sum of the effects of each applied separately. On the one hand, there is little mysterious about such interaction effects: the outcomes of these mutually reinforcing interactions can be logically explained. On the other hand, however, often unexpected synergisms occur: frequently the outcomes of interactions are not predictable, because of the large number of factors that can be involved. Evans (1993), for example, points out that the yield improvements from the last few decades are due to *often unexpected* synergisms between agronomy, plant breeding, fertilizers, pesticides, fungicides and herbicides (in:Holden 1994). Another (non-agricultural) example is a football team: sometimes a team performs well and the whole is more than the sum of the parts, another time performance is moderate and the team is 'just' the sum of the parts. What causes the 'magic' of holistic performance, how does effective and well-timed interaction occur, what causes the synergetic effect of interaction among players, what makes a collection of eleven individuals an eleven-headed unit -a true team- rather than an aggregate of eleven individuals? Successful sportsmen speak of 'the click of communality', 'a sixth sense', empathy and intuition, or 'a group mind' (Sheldrake 1989:250). Individual athletes speak of 'the Zone', 'the exercise high', 'the runner's high', 'the groove', 'being unconscious', or 'being locked in' when they refer to the elusive moments of peak performance "where there are no thoughts and the crowd and the contest disappear into a magical moment of perfection, a total harmony of mind and body" (Douillard 1995:xviii,3). Similarly, *inter*disciplinarity in *multi*disciplinary FSR teams can emerge with the synergetic effect of interaction among team members: the team functions then as a synergic whole. Equally, if not more, important is that all team members have insight in the farming system under study: they must master the farming systems perspective and be able to operate within a systems perspective (section 5.1: operational problem 15).

Brouwer & Jansen (1990) argue that interdisciplinary collaboration in multidisciplinary teams is based on the presupposition that disciplinary knowledge is complementary: collaboration will result in a more complete view of reality. This, they say, conflicts with the basic principle in systems theory, namely that 'emergent properties' exist: the system is more than the sum of its parts. It is unclear how multidisciplinary teams handle these emergent properties. Savory (1991:30) holds a similar view when he says that "the fact that wholes have qualities not present in their parts causes the interdisciplinary approach to fail". Only by having seen the whole, one can ask the right questions about the parts[9]. In multidisciplinary teams with various single-discipline trained specialists, or in

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constellation of atoms in sugar react with the atoms in our taste papals on our tongues, we still cannot explain what the taste of sugar is.

9. Says Savory (1991:32): "In practice all management decisions [have] to be made from the perspective of the whole under management. ... First, however, the whole [has] to be defined...and we [have] to know what we [want] to do with it (goals). But how does one define a whole... To isolate a lesser whole by giving it a sharp and arbitrary definition such as farm, national economy, watershed, national park, tribe, etc. at once cripples the management of it. ...the boundaries are very fuzzy. At this point a practical person might throw in the towel on holism as hopelessly academic. The idea of managing a whole that has no clear limits short of the edges of the universe is reminiscent of Archimedes's claim that he could move the earth if he only had a place to stand".

The place to stand in Savory's 'holistic resource management' model are the four ecosystem foundation blocks: mineral cycle, water cycle, energy flow, and succession. Any intermediate whole (holon) can be defined in terms of these four processes. "The manager who defines the whole within his realm of responsibility and interdisciplinary teams with generalists trained in several disciplines, the researchers look from the outside to a whole (holon), in our case a farming system. Approaching matters from this direction leads to confusion because the whole can never be seen from the perspective of the disciplines (ibid.:33). We must reverse the arrows, and look outward from the perspective of the whole at all available knowledge from the various disciplines. Only the persons who are directly involved in -and manage- the whole, command the outward-looking perspective vital to their particular management needs (ibid.:34). This puts the farm-household members central, and underscores the importance of participatory approaches and indigenous knowledge. Nevertheless, it remains important, in my view, that also researchers (specialists and generalists) master -to the largest extent possible- the farming systems perspective. If researchers are not able to operate within a systems perspective, requests from farmers and other stakeholders for sound advice that serves the holistic view, cannot be met (we will return to these issues in chapter 11: Diagram 16).

Schroevers (1984) and Van Asseldonk (1987) emphasize the importance of holism as a scientific paradigm and methodology, and not only as a general philosophy of life or an article of faith. According to Van Asseldonk (1987) the development of a holistic scientific practice is hampered by the lack of a theory of holism. He refers to Koestler's concept 'holon' as a possible contribution to the development of a holistic agricultural science. A holon displays two opposing tendencies: an 'integrative or self-transcending tendency' which enables the holon to function as a sub-whole in a larger whole, and a 'self-assertive tendency' which maintains the individual autonomy of the holon. The polarity of these *self-assertive* and *integrative* tendencies -called *the Janus principle* by Koestler- is inherent in the concept of hierarchic order[10].

> "Empirically, it can be traced in all phenomena of life; theoretically, it is derived from the part-whole dichotomy inherent in the concept of the multi-layered hierarchy" (Koestler 1989:56).

A holistic study aims at investigating the conditions under which self-assertive and integrative tendencies are 'balanced' in such a way that holons, and their higher-level and lower-level holons,

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formulates goals in terms of the four basic processes will automatically handle details properly in the context of greater and lesser wholes.. ... [since] the basic principles that govern the ecosystem are universal and equally relevant at all levels" (ibid.:33). To my mind the weakest link in Savory's model is the process of setting goals, which he says should be the starting point, but also proves to be the hardest part (section 6.2). Especially when the holon comprises stakeholders with widely diverging goals, interests and convictions, negotiated consensus may be hard to reach (section 6.2) (also the design process starts from goals: see section 1.2). Later on we will see that a coherent and high quality 'collective consciousness' -a central concept in the transcendentalist paradigm- can facilitate this process, and that 'the place to stand' could be the field of transcendental consciousness.

10. "It is only in times of stress that a holon may tend to get out of control, and its normal self-assertiveness changes into aggressiveness - whether the holon is an individual, or a social class, or a whole nation. The reverse process occurs when the dependence of a holon on its superior controls is so strong that it loses its identity". Excessive subordination is dangerous. "The loyalty of individuals towards their clan reflects their integrative tendencies; but it enables the clan as a whole to behave in an aggressive, self-assertive way. The obedience and devotion to duty of the members of the Nazi S.S. Guard kept the gas chambers going. ... The infernal dialectic of this process [private interests versus national interests] is reflected throughout human history. It is not accidental; the disposition towards such disturbances is inherent in the part-whole polarisation of social hierarchies. It may be the unconscious reason why the Romans gave the god Janus such a prominent role in their Pantheon as the keeper of doorways, facing both inward and outward, and why they named the first month of the year after him" (Koestler 1989:57).

can function optimally. According to Van Asseldonk (1987) the two-sided, complementary holism of Koestler would yield more knowledge than ‘the sum of the parts’ of the reductionist specialists. The question is then *how* to balance the two opposing tendencies, *how* can a dynamic equilibrium be established, *how* can the two tendencies be integrated or adhered to simultaneously (see also section 3.4). An FSR team creates synergy when a dynamic equilibrium between self-assertive and integrative tendencies is established (and a football team experiences then ‘the click of communality’). Individual team members need to be willing and able to search for this dynamic equilibrium. We shall come back to this issue in chapter 11. The two opposing tendencies play also a role in social dilemmas (section 6.2): collective action is required, but integration implies that individuals lose (part of) their autonomy and must forsake individual, direct, short-term benefits. In this section we have seen that Koestler’s Janus-faced holon -with its dynamic polarity of self-assertive and integrative tendencies- is an important contribution to a theory of holism. The concepts ‘holism’, ‘mastering a farming systems perspective’, ‘synergy’, ‘social dilemma’ and ‘dynamic equilibrium of self-assertive and integrative tendencies’ are closely related. When the two opposing tendencies are integrated, the whole becomes more than the sum of its parts.

7.3 Holism in agricultural science and rural development

Van Asseldonk (1987) distinguishes between holistic and reductionist generality. *Holistic generality* is an approach in which agriculture is seen as a ‘whole’ and problems are tackled in an integrated way without splitting them up in sub-problems to be covered by specialized disciplines. *Reductionist generality* is the multidisciplinary integration in retrospect of sub-solutions developed by specialists. It is important to know whether knowledge about the cohesion of a system can be obtained by means of integration in retrospect or by means of an integral approach: when both approaches can yield this knowledge, then the choice between reductionism and holism is no longer a fundamental issue (ibid.). Van Asseldonk considers both forms of generality complementary. At the same time he sees Koestler’s holism as a useful approach which yields more knowledge than ‘the sum of the parts’ in reductionist generality (section 7.2).

Koningsveld (1987a) pleads for the development of a modern agricultural science which is characterized by a more integrated formation of theory than was the case in the classic, fragmented and specialized agricultural sciences. This modern agricultural science must provide a wider perspective on rationalization, including the rationality of the social and individual ‘domains of action’ (social dilemma: section 6.2). The present, rather simple, superficial and narrow concept of rationality -based on economic efficiency- requires adjustment: an explicit theoretical reflection on the normative-rational character of this concept must result in societal rationality (Van Hengel 1995a). First steps towards a modern agricultural science can, according to Koningsveld, be found in farming systems research and in systems analysis of agriculture. In his analysis of conventional agricultural science he distinguishes two types of problems: problems as *anomalies* and problems as *crisis situations* (Koningsveld 1986a). A problem is an anomaly when it can be solved with available, time-tested conceptual means and with the standard technical approach, although sometimes first new instruments must be developed. A problem is a ‘borderline’ problem or crisis situation when it cannot be solved with available conceptual means, but requires a fundamental theoretical innovation of the conceptual framework of agricultural research, and a new problem-solving method. In a crisis situation the limits of the old theory become more and more visible: the problem is exceeding these limits. Exactly the fervent attempts to solve problems with available means make the failing of those means more and more manifest. The means that hitherto were so powerful become, as it were, exhausted and their continued use threatens to make matters even worse (ibid.)[11]. The challenges exceed a critical limit.

Koningsveld (1987b) speaks of *procedural integration* when problems in agriculture are interpreted as anomalies, and a systems approach is used as a formal methodology (often a mathematical instrumentarium) to integrate the fragmented agricultural sciences. Such a systems approach does not add much to conceptual innovation: it is just a methodological tool to integrate parts of a whole. This is the case in most positivist hard systems research, in which so far mainly technical disciplines and economics play a role. Most FSR attempts to operate within the holistic perspective of the positivist paradigm (albeit mainly without formal modelling exercises), but coherence of wholeness, emergent properties and systems dynamics are largely missing in FSR work (section 6.1: *type of system*). In practice most FSR boils down to a mere linking up of a limited number of disciplines, mainly agronomy and agricultural economics: it is at best integration in retrospect of sub-solutions developed by discipline-oriented scientists, which does not yield more knowledge than the sum of the parts. Joint reports by FSR teams are often just the sum of the parts (section 5.1: operational problem 15). Although the holistic character of FSR demands a simultaneous tackling of problems of different categories and different levels (section 5.1: operational problem 1), the irreducible integrity of the farming systems perspective is often reduced to a few technological problems at farm level.

A dogmatic position that describes procedural integration as mere treatment of symptoms, or as a looking for partial solutions which leads to obscuration of real problems, is not useful (Koningsveld 1986a). Exactly those attempts to solve problems with a standard approach will contribute to clarification of the limits of the classical agricultural sciences, so that the character of the problems, we are facing, can be more adequately defined (ibid.). In a crisis situation, however, a new theory about ‘the system agriculture’ is required: such a theory must conceive of agriculture as a unity of a bio-technical and social system, a socio-technical system with material processes and actors. A systems approach entails here the formulation of an agro-system theory. When such a fundamental conceptual innovation is at stake, Koningsveld (1987b) speaks of *theoretical integration*. It entails the formation of a theoretical framework at a level above the fragmented agricultural sciences in order to encompass agriculture in its totality; this should allow for an

11. Says Savory (1991:293): “Massive monocultures in farming have spawned a whole cluster of spiraling problems characterized by public unwillingness to question the root cause. Rather than admit the inherent instability of monocultures, we try to keep them viable through chemistry, machinery, genetic engineering, and ultimately cash subsidy. More often than not, however, the side effects of these fixes exacerbate the problems. Though few farmers in the world enjoy higher product prices or cheaper input costs in vehicles, fertilizers, etc., we [in the USA] still have broke farmers blaming overproduction, low prices, and high costs. If those really are the causes, one might wonder why the Amish and many other farmers who approach agriculture with different assumptions remain profitable”. Savory (ibid.:287) continues: “The real problem is the temptation of quick fixes, sweetened immensely by the power of modern science to conjure up spectacular ones at the drop of a hat. ... Instead of fixing what’s really broken or finding a fundamentally different path, we print more money, invent a new drug, make a bigger bomb, suppress or buy off dissent, or build a dam”. Instead of only suppressing symptoms of problems and developing nonsolutions, we should correct the causes.

integration of contents of the fragmented agricultural sciences. The agricultural system in its totality is more than the sum of the parts studied by the fragmented agricultural sciences, so that for an adequate study of the whole also concepts of a higher level must be developed (ibid.). The reductionist and holistic generality, as formulated by Van Asseldonk (1987), can be compared with Koningsveld's procedural and theoretical integration successively. Koningsveld's concepts are clarified in Diagram 9.

Reductionism does not only create the dilemma of integration, but it also results in emergence of typical 'white spots' in the agricultural knowledge system, i.e., areas which remain inaccessible to reductionist-oriented scientists. Some fundamental questions are neglected because they do not fall within the domain of any single discipline (Van der Ploeg 1987:124). In my view the integration of contributions of different disciplines (*inter*disciplinarity in *multi*disciplinary teams) and the interrelated claim of holism are such 'white spots' in most FSR. The long list of operational problems and the hitherto limited impact of FSR are signs of, what Koningsveld calls, phenomena signalling a crisis: a crisis which demands fundamental conceptual innovation and a new problem-solving method. The formation of an agro-system theory is still mainly based on speculative notions, but then all theoretical innovation is based on speculation (Koningsveld 1987b). The attempt to integrate technical matters with economic, political, social, and cultural issues from the social domain of agriculture will not be easily realized, since many in the dominant scientific paradigm consider this unacceptable (ibid.). Farmers, however, have to integrate all these aspects in their daily practice, they must master the 'craft' of farming. "Only farmers can bring realistic 'holism' to a research project" (Rhoades 1994) (section 5.1:operational problem 1). This is in line with the remark that only farmers command the outward-looking perspective (section 7.2). About fifty years ago agricultural science -the classic agronomy- was still described as an 'art' (Van der Ploeg 1987:118). Engel (1995:13) speaks of the 'art, craft and science' of agronomy. In the last decades, however, 'agronomy' as the knowledge of agricultural practice in all its diversity, was transformed into the current fragmented agricultural sciences. Agriculture became in the eyes of scientists a domain of mere technical acts, the farmer became a 'homo technicus' and 'homo economicus', and agricultural science became a 'partial' science, divided into separate parts (as opposed to a holistic science)[12]. Technical acts became isolated from their social context, resulting in a neglect of the social coordination of these technical acts (Van der Ploeg 1987:121). This 'halving' of agricultural science was probably inevitable: exactly this 'halving' was a precondition to the scientization of agricultural practice and contributed to the success story of agricultural science (ibid.:115).

A: Procedural integration (Koningsveld 1987b)
Reductionist generality (Van Asseldonk 1987)

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12. This development from 'classic agronomist' to 'homo technicus' and 'homo economicus' is reflected in the development of agricultural knowledge systems: from 'transfer of technology' to 'farm management' to -hopefully- 'facilitation of ecologically sound agriculture' (section 6.1: type of rationality). In this last knowledge system the farmer is expert at managing diversity and complexity (the starting point of, for example, Integrated Pest Management). In the ecological knowledge system farmers and scientists need to become 'classic agronomists' who are supported by a holistic agricultural science.

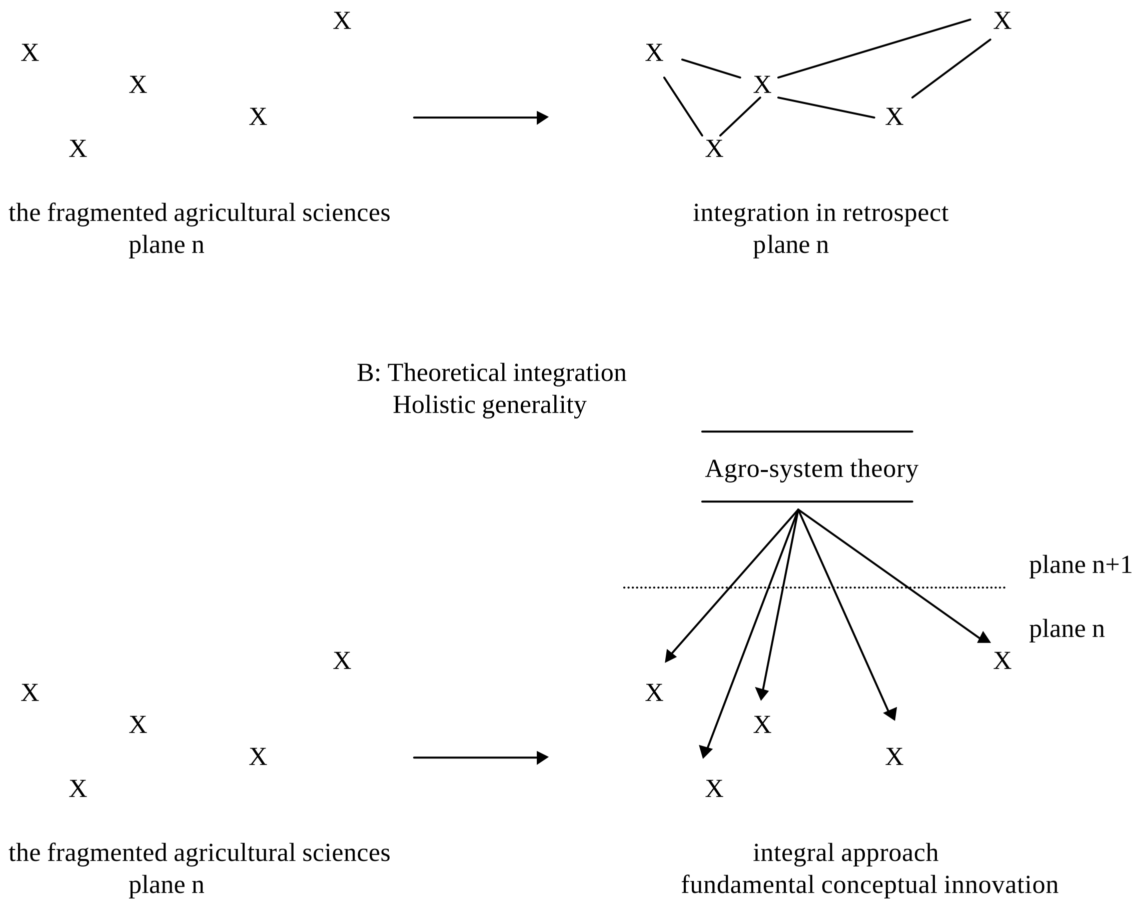

Diagram 9: Holism in agricultural science
In situation A, at best, integration in retrospect of sub-solutions developed by discipline-oriented specialists takes place. In situation B a new theory about the system agriculture -at a level above the fragmented agricultural sciences- is developed.

With regard to multi-disciplinary, integrated planning De Wit (1981) remarks:

> "...without a thorough multi-disciplinary analysis of the situation any measure easily results in blunders. The necessity for an adequate analysis should, however, not tempt us to pursue multi-disciplinarily inspired, integrated solutions. Each plan that in order to succeed requires changes in both the technical and socio-economic sphere -changes which must be attuned to one another- is already beforehand a failure, because the knowledge and control for implementation are, at least in the case of poor countries, not available. ... Of course, everything is related to everything else, but gaining insight in this connection is so difficult that especially poor countries cannot afford the luxury of integrated planning".

Integrated rural development projects have not been successful in the past. De Wit (ibid.) is in favor of 'muddling through' from different perspectives, in each as such tenable directions, but he fears that this approach stands a poor chance, given "the fashionable preference for tackling problems in a fundamental way at a level of integration that nobody can cope with". In my view these remarks on 'difficulties of gaining insight in cohesion' and 'levels of integration that nobody can cope with' are not only relevant to 'poor' countries, but as well to the Western world. The persistent problems in, for example, the Dutch agricultural sector show that multidisciplinary, integrated planning has not been adequate in this case either. The undesired side-effects of modern agriculture (such as over-production and environmental pollution) bear testimony to our inability to integrate technical, economic, and environmental issues. In East Africa smallholder farming is a 'way of life': many aspects are involved and the need for a farming systems perspective and integrated approach is obvious (section 2.3)[13].

7.4 Conclusion

The conclusion is that we have learned more about F: the (implicit) frameworks of ideas and concepts underlying especially the holistic aspect of FSR have been explicated. In order to be able to increase the impact of agricultural science on farming systems of resource-poor farmers, the *belief* in the powerful positivist-reductionist paradigm -in scientific rationality- needs to be open to discussion. Philosophical knots of the past need to be untied. In this chapter various philosophies of nature have been presented: the holistic-organismic philosophy, together with Koestler's Janus-faced holons, seems especially appropriate to the field of agriculture. The holon symbolizes the missing link between reductionism and holism. The first two main issues selected in section 5.2 -holism and interdisciplinarity- are 'white spots' in FSR theory and practice, demanding fundamental conceptual innovation (at a level above the fragmented agricultural sciences) and new problem-solving methods. In order to go beyond integration in retrospect of sub-solutions developed by disciplinary scientists, and to preserve the irreducible integrity of the farming systems perspective, the 'art, craft and science' of agronomy must be (re)established. Synergy, interdisciplinarity and holistic performance seem to emerge with a dynamic equilibrium of self-assertive and integrative tendencies. The question remains *how* to establish such a dynamic equilibrium. A first step towards a possible answer is presented in the next chapter, in which an analysis of the metaphysical background of modern science and technology (quickly spreading in low-income countries) will be given.

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13. In this context it is unfortunate that at Wageningen Agricultural University interdisciplinarity is on the decrease in studies focusing on tropical agriculture and rural development (WUB 1997).

8 ANALYSIS OF THE METAPHYSICAL BACKGROUND OF MODERN SCIENCE

8.1 The rational-empirical consciousness

Environmental pollution is not an accidental event. It has a structural cause in modern industrial society, which is by nature expansive (Duintjer 1986). Dutch ‘front runner’ farms, for example, are structurally expansive, and although these farms face many problems (one of them being their contribution to environmental pollution), these problems seem to accelerate their continuous expansion. The group of ‘front runner’ farms becomes smaller and smaller; the ones that cannot compete anymore are pushed out, it is a ‘rat race’ (Van der Ploeg 1987:99). The ‘front runner’ model is underpinned by Cochrane’s (1958) ‘agricultural treadmill’ in which early innovators capture wind-fall profits, while later adopters are forced to adopt (or quit) when productivity gains are passed on to agribusiness and consumers in the form of lower prices (Röling et al. 1997). A considerable part of the farmers have internalized the ‘front runner’ model, and make it a self-fulfilling prophecy (Van der Ploeg 1987:108) (the upper route in Diagram 5 in chapter 3 is emphasized). Farmers think (and are told) that a continuing scientization is the only option to survive, and make in this way the ‘front runner’ model reality, regardless of the consequences. Technological innovation implies an in-time increasing pressure or ‘coercion’ to apply it (Renkema 1986). When farmers in the dairy sector intensify their production, the increased supply of milk lowers the milk price which requires again adaptations in the farm. A vicious circle of changes in prices and farm adjustments, in which causes and effects continuously interchange place, is the result. The two causes that keep the vicious circle going are technological development and divergent interests with regard to the most desirable volume of production - the individual producer and the group of dairy farmers as a whole have differing interests (ibid.) (the concepts ‘social dilemma’ and ‘holon’ with their self-assertive and integrative tendencies apply here: sections 6.2 & 7.2). In spite of the irrationality of continuing production increase (problem of over-production) the ‘front runner’ model as such, until recently, has not been questioned. At present, however, the number of farmers in The Netherlands is so small that there is hardly any space left for the head to eat the tail (Van Drumpt & Röling 1997). Continual scientization makes the agricultural practice also more and more uniform: the bio-industry and glass wool culture are far-reaching realizations of uniform laboratory situations in agricultural practice (De Vries 1992). This uniformity, in turn, renders more validity to the scientific method. The current emphasis on market liberalization, global competition and decreasing public investments as the best strategy to achieve global food security and a sustainable agriculture, makes it, in my view, very difficult for African smallholders to develop. They will not be able to compete with products from the Western world, which after decades of investments in agricultural education, extension and research, land consolidation, reorganization, subsidies, etc., have gained a nearly unapproachable position. The ‘front runner’ model might push millions of resource-poor farmers out of agricultural production.

Van der Ploeg (1987:99) remarks that research into the question *why* the Dutch agricultural sector is structurally expansive, is lacking. An analysis of the structurally expansive character of modern industrial society, which to my mind also bears relevance to the agricultural sector, has been provided by Duintjer (1983,1986,1988). He speaks of ‘a shared metaphysical attitude towards reality’ (ibid.:1983). Most Western philosophy is practised against the background of a certain kind of consciousness, namely the ‘rational-empirical consciousness’ (ibid.:1988b). In this state of consciousness all experiencing and acting is accompanied and structured by discursive thinking, which rambles from one topic to another. Discursive thinking takes place at the level of the discursive consciousness, which is the part of consciousness that deals with knowledge which can be verbalized (section 3.2). Discursive thinking refers to an inner argumentative ‘discourse’. The rational-empirical consciousness is the presupposed and overarching (therefore ‘metaphysical’) background of modern science and technology, and it has the tendency to spread to all areas in society (ibid.:8). This continuous thinking, or *talking to oneself, inner talk, internal dialogue*, goes mainly unnoticed (ibid.:60,99). The predominance of the mode ‘*thinking*-being’ is very subtle: it is difficult to become aware of the fact that it is so dominant because of the nothing-excluding universality at the object-side. Everything can come up for discussion as an object: we can think about anything. With most people the one-sidedness is located at the ‘subject’-side in the sense that we identify with the rational-empirical consciousness as if no other modes of consciousness are possible (ibid.:121). This identification of the subject with the rational-empirical consciousness and the continuous expansion of it are, however, unnecessary. Duintjer (ibid.:100) indicates the possibility of a consciousness in which the talking to ourselves calms down, in which inner silence goes together with alert attention. Before I proceed to the next paragraph, in which the possibility of such a state of inner silence will be explored, I want to emphasize here that Duintjer’s analysis is relevant to the subject of this study. Western trained, local and expatriate agricultural researchers, elites in low-income countries, and Western donor agencies share a common metaphysical attitude towards reality. When philosophy is defined as the explicitation of such metaphysical attitudes towards reality (ontologies), then a philosophical analysis is relevant to both western and non-western agriculture. The positivist paradigm is characterized by a *belief* in instrumental and strategic rationality, but many (agricultural) scientists do not even realize that they are true believers in ‘the cathedral of science’, and that this non-awareness is due to the continuous identification with the rational-empirical consciousness.

The thinking process can be illustrated with the analogy of a bubble rising in a pond (Maharishi Mahesh Yogi 1968:48,1969:470)[1] (see Diagram 10). The analogy is an instructive model, but, of course, should not be taken too literally. The process of thinking starts from the deepest, most refined level of consciousness: the level of pure or transcendental consciousness, the consciousness-as-such without any *content* of consciousness, with only mental silence (section 3.3). Thought-impulses start from this silent creative centre within, as bubbles start from the bottom of a pond. When the ‘thought bubbles’ arrive at the gross conscious level of everyday thinking they are appreciated as conscious thoughts. The more subtle states of thoughts, below the threshold for conscious experience, are not consciously appreciated. Thoughts rise through the whole range of the depth of consciousness until they finally appear as conscious thoughts at the surface. Expansion of the conscious mind takes place when thoughts are already consciously experienced in their infant state. The depth of the conscious mind can become greater and greater until even the level of pure consciousness is brought within the range of the conscious mind. Through meditation techniques the mind can be trained to experience earlier and earlier stages of the ‘thought bubble’ until finally the

1. Maharishi Mahesh Yogi is an Indian physicist and philosopher, and founder of the Transcendental Meditation (TM) movement. Since 1972 I practise the Transcendental Meditation (TM) technique as taught by Maharishi Mahesh Yogi.

subtlest stage of thinking is transcended, and one reaches the source of thought. This level of pure consciousness is experienced as a deep unitive silence beyond all thought, a state of complete mental stillness and full inner wakefulness, a state of restful alertness (Russell 1990:34). The possibility of a consciousness in which the continual thinking -the inner talk- calms down, as indicated by Duintjer, can thus be realized through meditation techniques. From the foregoing discussion one can infer that the full mental potential of man is unfolded only when the conscious capacity of the mind is enlarged to the maximum limit - when the threshold for conscious experience is lowered until it coincides with the bottom line in Diagram 10.

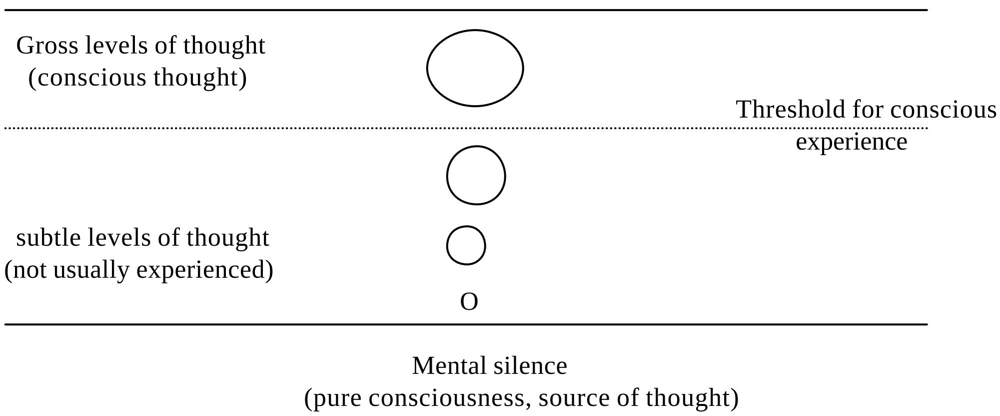

Diagram 10: The process of thinking
(adapted from Russell 1990:34)

How can we deduce through logical thinking the existence of a consciousness-as-such without any content? Duintjer (1996) maintains that our conventional world is an interpreted world: our perceptions, thoughts and actions are directed and structured by some *learned* frame of interpretation. These frames of interpretation are historically-situated, cultural patterns (this is the constructivist position). The question then arises: *from where*, from which position can these frames be learned and entered, be put into perspective and transcended? Do we participate in a ‘consciousness’ that precedes our cultural and personal consciousness? According to Duintjer’s affirmative answer to this question, that preceding consciousness is an all-encompassing, *trans*-discursive and *trans*-personal consciousness - the *transcendental* consciousness (ibid.). To my mind straightforward, consistent and clear reasoning (which is the quintessence of science) demands the existence of ‘something’ beyond *learned* frames of interpretation. Koningsveld (1995) speaks of the ‘starting problem’ which has not been solved yet by contemporary science: when perception presupposes a conceptual framework, and when the formation of such a framework in turn requires experience with ‘outside things’, how does this process then initially start - how does the very first observation come about? When each fact is a theoretically constituted fact and an objective ‘rock bottom’ for theories does not exist, what is then the starting point? Koningsveld (ibid.) and most of his colleague-philosophers seriously doubt whether it is possible to clear one’s consciousness of all content, and *even when* it would be possible, one would be ‘seeing but blind’. Without a conceptual framework man would be as a blind person with healthy eyes. Habermas speaks of a previously existing *interpretative* framework, which is necessary to understand the meaning of theoretical statements (Leeuwis 1993:96). The general assumption is apparently that a state of consciousness *without any interpretative activity* of the mind is impossible. A state of pure consciousness, in which all thinking has been transcended, is deemed inconceivable, incomprehensible or unthinkable. As a matter of fact, the state of transcendental consciousness *is* unthinkable: it can only be directly experienced by transcending all thinking. The 'problem' with transcending is that it cannot be meaningfully explained to others; you just have to experience it, in the same way as you have to taste an apple in order to know its specific taste, or to see a color in order to appreciate its nuances. One can spend hours in explaining how an apple tastes, but without the actual experience of eating an apple all this remains superfluous: the proof of the pudding is in the eating. Tastes and colors, one can argue, are emergent properties[2]. The experience of transcendental consciousness is also an emergent property for which one can prepare oneself through, for example, meditation techniques, but which is novel, emergent, different from experiences at other levels of consciousness. Descartes' dictum *cogito ergo sum* (I think therefore I am) implies that the only 'being' is '*thinking*-being'. It denies the possibility of a state of consciousness beyond thoughts - a state of just 'being'.

Through the continual identification with the rational-empirical consciousness we become prisoners of our own mental conditioning (De Wit 1996): a specific worldview becomes engrained in our mind. In order to enhance the possibility to modify worldviews and to appreciate the worldviews of others, we must be able to 'let go' of the identification with the rational-empirical consciousness. The step-by-step learning process to go beyond this identification -to deepen and broaden our consciousness- can be referred to as spirituality (Duintjer 1988b:140). Spirituality as an experiential path to and from the inner source -the level of transcendental consciousness- is by nature based on personal experience and practical self-investigation (ibid. 1996). This makes spirituality fundamentally different from any belief in authority (we will come back to this issue in the sections 8.2, 8.3 and 8.4). Theistic traditions, holy books and spiritual teachers can be helpful, not with statements which one has to believe based on their authority, but rather with hints for a practice which one can try out oneself and which leads to personal experience (ibid.)[3]. In this study 'the spiritual' is not equated with an entity (being, phenomenon) beside or above other entities within our experiential world, nor with a separate entity outside that world. It rather is something that pervades our whole experiential world. It constitutes the overarching and all-pervading depth-dimension of all possible experiential worlds (ibid. 1988c). Spirituality is here highlighted as *direct, experiential contact* with a reality that transcends prevailing frames of reference. In a process of transcending one steps backwards -out of the established frames of our habitual experiential world- to the preceding and all-embracing dimension where all 'measure-giving' frames and possible experiential worlds can be stepped into (ibid. 1988a:50). In Diagram 10 the level of transcendental consciousness constitutes this inexhaustible dimension, the potentiality to all frames.

In this context it is important that we do not only *think about* what lies beyond our measure-giving frames; in that case the thinking and the thinker remain where they are, i.e., within

2. See footnote 8: chapter 7.

3. The Transcendental Meditation technique is an example of a true self-help technique, which does not rely on a belief in whatsoever.

their established frames-of-thought (ibid.:89). It must not only remain an intellectual 'transcending' *in thoughts* (ibid.:98). The crucial point is to make contact with the all-embracing dimension which extends beyond thinking, with the point of silence *before* all thinking. At this point thinking is only one of the possible levels of manifestation, be it our most common medium (ibid.:129/130). Since transcendental consciousness transcends all our prevailing frames of reference, fundamental difficulties with intelligibility and comprehensibility arise when one tries to discuss this state of consciousness which is situated beyond the frames of our usual modes of thinking, speaking and acting (ibid.:111) (Later on we will see that the mind's attempt to *think* about transcendental consciousness is labelled 'paradoxical reason': section 8.4). Since thinking, speaking and acting are manifestations of 'being', we must try to come into contact with underlying modes of being (ibid. 1988b:182). Transcendence of the intellect does not imply that intellectual thinking should be abandoned, but it must be used with care, keeping in mind its limitations (such as the current undue emphasis on quantifiable and controllable factors). We must liberate ourselves from the predominance of the mode '*thinking*-being' or the identification with the rational-empirical consciousness.

Many scientists will denounce the possibility of the existence of a *trans*-personal and *universal* level of consciousness. Any reference to *universality* -justifiably- meets with suspicion in modern society. In modern society we are daily confronted with a multitude of worldviews, *and* with the factual putting into perspective implied in such a diversity. In this situation one can embrace a specific tradition or worldview as an encompassing and unshakeable foundation: examples of 'fundamentalism' can be found in all theistic traditions, but sometimes also in political ideologies, materialism and scientism (ibid. 1996). Grand theories easily degenerate into racial particularism or religious fundamentalism. In order to distinguish between the multitude of worldviews they should not only be tested on their degree of truthfulness, but above all on the degree of integral rationality required from subscribers. Such an integral rationality proves itself in a tangible respect for all forms of life (Kockelkoren 1992:188)[4]. Universality in the context of spirituality refers to the experience-based notion that a creative source of all cultures and traditions appears to exist (Duintjer 1996). Throughout the history of mankind numerous scientists, artists, philosophers and sages in different cultures have referred to this creative source (see a.o., James 1958; Stace 1960; Maslow 1964; Scharfstein 1973). Inner paths to this unbounded, trans-personal source (in Plato's metaphor 'outside the cave') can be followed from many traditions, but any 'concretization' -intellectual, artistic, practical- is filtered by the cultural and personal condition of a certain individual (ibid.). Any intellectual-philosophical putting into words of 'transcendence' is -in the terminology of the constructivist paradigm- socially constructed. It must be emphasized, however, that 'transcendence' can neither be predicted nor engineered from the relative, socially-constructed world. It can happen to us, it can reach our consciousness insofar we voluntarily can receive it, and the preparation to this receptivity leads to a spiritual attitude of life which -as a matter of course- will prove to be societally favorable (ibid.) (I will come back to Duintjer's assertion that a spiritual attitude of life is societally

4. Later on we will not only see that integral rationality is an important component of the transcendentalist paradigm, but also that this paradigm is not fundamentalistic in any sense. In the perspective of the transcendentalist paradigm a universal transcendental consciousness underlies the manifold socially-constructed reality. Furthermore, the paradigm is characterized by an absence of belief in authority: it emphasizes direct, personal experience.

favorable: section 9.2). Although transcendental consciousness cannot be engineered, the receptivity to gain access to the level of transcendental consciousness can be trained. In this study spirituality is thus defined as the process in which one *systematically* trains the receptivity to gain *regular* access to transcendental consciousness. Especially in the context of this scientific study it is important to highlight that *systematic* training is necessary in order to gain *regular* access to transcendental consciousness. Methods and techniques which do not result in *regular* experiences of transcendental consciousness cannot claim to be scientific. Although haphazard experiences of transcendental consciousness can be literally ‘life-transforming’, the scientific approach demands regular and repeatable access to transcendental consciousness[5].

In the spiritual wasteland of contemporary society characterized by spiritual emptiness and ontological insecurity, the postmodern mind struggles with “a pluralism bordering on distressing incoherence” (Tarnas 1993:398). In our problem-ridden world an external vantage point -an extrahistorical Archimedean point- seems to offer hope of ceasing the ambiguity. However, Aans (1991) cautions for the re-introduction of the role of the ‘universal intellectual’ who is thought to be capable to pass judgement on prevailing situations and problems. An absolute meta-position for intellectuals does not exist; whatever position one chooses, it will always be situated in a historical-societal context. An Archimedean point outside the historical-societal reality does not exist: a trans-historical, universal perspective is impossible. Truth is always historicized, since reflection -which tries to reveal truth- is based on socially and historically constructed structures of *thinking* (ibid.). The *thinking* of each intellectual turns out to be fundamentally limited, and this limitation cannot be *logically* transcended. Therefore, a solid philosophical, i.e., universal, basis for societal rationality cannot exist. The observation from Aans that the fundamentally limited thinking of the intellect cannot be *logically* -i.e., by thinking- transcended, is correct (the baron von Münchhaussen act)[6].

5. The Transcendental Meditation technique is an example of a technique which provides systematic training in gaining regular access to transcendental consciousness. As we will see later on, the individual and societal effects of the TM technique are thoroughly investigated. Extensive scientific research shows that these individual and collective effects are beneficial and societally favorable. TM is one meditation technique out of many, which all aim at the facilitation of access to transcendental consciousness. In the longstanding human quest for mystical experiences TM constitutes a relatively small movement. The reasons why I focus on this particular operational technique will be expounded in section 9.4.

6. Chopra (1991:116) remarks: “Thinking your way out of thought is like trying to get out of quicksand by pulling yourself up by the hair. ...there is more to the mind than thinking”. We can transcend the thinking, and experience the deeper reality of the silent witness. Chopra (ibid.:107) gives the following analogy to clarify the position of the ‘silent witness’ inside us. “To project a movie requires a screen... The images move and play on the screen; vivid emotions and high drama are enacted. Despite all that, the screen itself isn’t engaged. It’s not part of the movie... The difference between the mind and a movie screen is that we do become engaged in the movie, because it’s *our* life. The screen inside us becomes so soaked in compelling personal images that the sense of there being a screen -an unchanging, unaffected part of the mind- is lost. ... ..if you strip all of these images away, something of “me” is still left: the decision maker, the screen, the silent witness”. ... The aim of meditation is “to systematically uncover the silent witness inside us, a possibility open to anyone at any time” (ibid.:109). ... “The process is like following a gossamer thread until you reach the spider that spun it. My thread may be very different from yours, because I have spun the web of inner reality according to my unique experiences” (ibid.:110).

Koestler (1989:206) says: “We must distinguish .. between .. *general states of consciousness* -degrees of wakefulness, fatigue, intoxication- and the degree of *awareness of a specific activity*. The first refers to ‘being conscious’, the second to ‘being conscious *of* something’. The first corresponds to the overall lighting of the stage, the second to the beam concentrated on a particular actor”. Koestler (ibid.:218) speaks also of a state of

However, the identification with the rational-empirical consciousness can be transcended by systematic practice of meditation techniques. 'Inner talk' makes place for 'inner silence' through regular transcending of the discursive thinking. This state of 'inner silence' or transcendental consciousness could prove to be a kind of Archimedean point (we will come back to this issue in section 9.2).

8.2 Basic attitudes towards nature and ecological spirituality

Spirituality is not just a hobby for unworldly and vague persons, but in the present situation of the world, characterized by large humanitarian and ecological problems, a very relevant matter (Duintjer 1988b:144). The alienation of Western people from nature cannot be solved by the intellect, since exactly the limitation of the intellect -the continual identification with the rational-empirical consciousness- is the problem. Through the identification with the rational-empirical consciousness people became alienated from more participatory modes of being, and in that way alienated from fellow-men and other living beings (ibid.:147). The solution of environmental problems does not seem to depend primarily on technical innovation, but rather on normative learning, political reformation and development of personality in the sense of a different attitude towards nature (Koningsveld 1991). If there is no personal experience of direct connectedness (via participatory modes of being), then one needs *rational morality* to 'order' or to 'command' connectedness. Rational morality is a substitute which one needs when primary togetherness cannot be directly experienced. Rational morality, however, rather should be an emergency measure for those situations in which we do not experience direct connectedness (Duintjer 1988b:168; Vink 1987). In modern society environmentally friendly behavior depends, by and large, on the upper route in Diagram 5 (chapter 3): we must comply or identify with externally imposed ideas, because of the non-accessibility of participatory modes of being. When we would experience connectedness with all other (living) beings -with nature in its totality- then the lower route in Diagram 5 would also apply. When the attitude toward appropriate environmental behavior would be based on self-evaluation, and the individual self would be experienced as being one with nature, then care for the environment would be a natural and automatic thing to do. Externally imposed moral pressure would be less necessary.

The environmental problem is an outstanding example of a social dilemma (section 6.2). People are 'holons' characterized by personal and public interests (section 7.2). A dynamic balance between self-assertive and integrative tendencies -between a selfish quest of maximizing personal utility and negotiated agreement on sustainable use of life-giving ecological services of the biosphere- must be established. Do people trust one another, and do they adhere to negotiated agreements? Is rational morality a sufficient condition to the development of a sustainable society? To my mind it is evident that externally imposed norms and values -that appeal to the discursive and practical consciousness- hitherto, at best, have only been partially effective in generating societally and environmentally friendly behavior. Therefore, it might be prudent to search for additional measures. As indicated in section 3.3 I distinguish -but not separate- externally and internally 'imposed' norms

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"pure consciousness, without object or content other than consciousness itself". One could also say that there must be a carrier (the pure consciousness) and content of the carrier.

and values. The latter are grounded in an individual, experiential spirituality resulting in participatory modes of being. I maintain that hitherto the major religions, by and large, have not been able to generate such an internally inspired morality (apparently, effective techniques that result in an experiential spirituality have not been available to the majority of the population). In this context the difference between Confucianism and Taoism is enlighting. The first emphasizes morality and state, while the latter stresses an 'anarchistic', nonlocal spirituality (Zhuang Zi 1997). The distinction between rational morality and spirituality is exemplified in successively the upper and lower routes in Diagram 5. In the post-industrial 'risk society' (Beck 1992) a 'post-normal science' (Funtowicz & Ravetz 1993) is a matter of widely shared learning and collective solution building. At the interface between ecology and human development a single reliance on free market forces and regulatory control might be misplaced (Röling et al. 1997). In chapter 9 I will argue that collective learning and action at this interface can be facilitated by the introduction of the concept 'collective consciousness'. This central concept of the transcendentalist paradigm plays a role in both the upper and lower routes in Diagram 5: it has an impact on rational morality as well as spirituality. Good governance in the domain of environmental management must be grounded in an experiential spirituality *and* in facilitation of social learning for collective action. In order to overcome social dilemmas both routes demand attention: individual spirituality *and* negotiated agreement resulting in a collective rational morality. With regard to common property resource management stakeholders must reach agreements on 'taking less' and 'giving more'. In my view, experiential spirituality does not only facilitate the emergence of environmentally friendly basic attitudes, but facilitates also the process of negotiated agreements. The (*apriori*) willingness of people to agree to act, and actually to act, is positively influenced by spirituality. Later on we will see that human morality is affected by access to transcendental consciousness (in section 9.4 some scientific evidence will be presented that supports this statement).

Since the underlying cause of environmental pollution and resource depletion is an exploitative consciousness -the biggest problem is our greed as Gandhi said- the solution too needs to be sought at the level of consciousness. In our 'consumer society' most people have a continual need to reaffirm their sense of personal identity[7]. Unfortunately, this reaffirmation occurs at the expense of the environment. In the name of progress the consumer society, assisted by a bombardment with advertising, moulds irreplaceable resources into "objects of temporary support for the ego" which once their psychological value has been spent, are thrown away as scrap (Russell 1990:176). We buy the 'right' cigarettes, cars, clothes, and so forth because they reinforce our ego, our derived sense of identity[8]. It is evident that one cannot put the blame on a few powerful 'exploiters' who manipulate the rest of society. One cannot sell somebody something that he/she does not really need, unless it is needed psychologically (ibid.). Röling (1995:25) speaks of the

7. Giddens' concept of 'lifestyle' refers to the coherence between the diverse social practices which together make up our lifestyle, and to the 'narrative of the self' or the 'identity of the actor' that goes along with these practices (Spaargaren 1997:29). A lifestyle expresses a person's individual identity and associates this person with -or distinguishes him/her from- others. The distinction mechanism is a powerful motive in people's behavior (Bourdieu 1984). According to Giddens a coherent 'life story' makes an important contribution to a person's sense of ontological security (Spaargaren 1997:147).

8. Already in the sixties -the era of 'better long-haired than short-sighted'- the Stones sang in their most famous, *and* most frequently *misinterpreted*, song -*I can't get no satisfaction*- not (only) about sexual satisfaction, but mainly about the advertisement-swamped consumer society. Unfortunately, little has changed since then.

societal construction of well-being as consumption. Paraphrasing Schumacher (1989), one can say that today we urgently need ‘an economy as if people and environment mattered’. Environmental economists argue that free market forces fail in bringing about sustainable common property resource management (Funtowicz & Ravetz 1994; Van Ierland 1996; Hanna et al. 1996). The root cause of our environmental problems is that:

> “We do not really appreciate our essential oneness with the rest of the world. We may know it intellectually, but we do not know it as an immediate awareness, as a personal reality. ... This awareness must come not merely as a change of idea but as a change of consciousness” (Russell 1990:176).

The dualistic awareness (‘me-in-here’ versus the ‘world-out-there’) as such is not at fault, but our complete dependence upon it is not necessary. We cannot build a non-exploitative, holistic, ecological ethic into our policies on the level of mere understanding, on the level of thought. The egocentric model must be transcended on the level of consciousness. A *direct experience* of oneness can be found at the level of transcendental consciousness, a preceding trans-personal consciousness resulting in a truly participatory mode of being (Duintjer 1996). The need to maintain our derived sense of identity -derived from the outer world- gradually decreases when we gain a greater awareness of the ‘true self within’ - the field of transcendental consciousness[9]. As I will argue later on the experience of the field of transcendental consciousness cannot be verified by the positivist research method, but other modes of verification are available (section 8.4). This experience is important in the establishment of an ecological ethic (a.o., Vink 1987, Duintjer 1988b, Russell 1990, Zweers 1996).

It is important to emphasize here that philosophical-scientific reflection on environmentally friendly behavior (the process represented by arrow number 1 in Diagram 5 in chapter 3) is a meaningful but roundabout mode, as opposed to (ecological) spirituality which is based on direct experience (arrow number 3) (Zweers 1996). Also rational morality is a roundabout way (largely taking place in the process represented by arrow number 2). Moreover, in modern society people are less and less inclined to accept norms and values based on somebody’s authority, be it God or secular authorities (Duintjer 1996). The concept ‘ecological spirituality’ refers to the *experience* of a fundamental, meaningful solidarity with nature, it results in a participatory ‘basic attitude towards nature’. The concepts ‘ecological spirituality’ and ‘basic attitude towards nature’ stem from the field of environmental philosophy. Both concepts figure as criteria in the characterization of the various scientific paradigms in Table 8, chapter 6.

In the basic attitude approach in environmental philosophy *images of nature* and *self images* are closely related. Zweers (1995b) discerns six basic attitudes (Box 16).

Box 16: Six basic attitudes towards nature (Zweers 1995b).

9. With reference to Diagram 5 in chapter 3 we can say that the reaffirmation of a sense of personal identity takes place at the level of the discursive and practical consciousness (arrows 1 and 2). Attitudes in the upper route are based on evaluations vis-à-vis external agents and/or ideas. One chooses -more or less consciously- to comply and/or identify with certain external agents/ideas, or not to do so. Our ego -our derived sense of identity- derives from these agents/ideas in the outer world. At the level of transcendental consciousness, however, we directly experience our *true* sense of identity - our Self.

"*1*. The *despot*, who subjects nature, if necessary by force, and deals with it at will, unhampered by considerations of morality or moderation; in present times this is the technocrat, who has unlimited confidence in technological possibilities, and for whom there are no limits to growth.
2. The *enlightened ruler*, who still reigns over nature, but also recognizes that he is dependent on it; in the interest of realizing human ends he strives towards developing nature's possibilities as much as he can, but he understands that exploitation and oppression are out of the question here.
3. The *steward*, who no longer controls nature on his own authority, but manages it on behalf of the "owner" to whom he is responsible: in the Christian variety that is God, in the secular variety, it is humanity. The tenor is conservative, the emphasis is on conservation of natural resources (i.e., the capital, the interest of which only may be utilized) and the scope is still mainly human-centered.
4. The *partner* works together with nature on the basis of equality, that is in order to realize the "aims" of both parties as well as possible. He strives for integration of fulfilment of social functions and some sort of nature development, both from a dynamic rather than from a static perspective. It is essential to partnership that nature's values and "interests" have now attained equal importance to those of humanity.
5. The *participant*, who views nature as a totality of which he is a part, not only in a biological sense, but especially in the sense that there is an experience of solidarity with nature from which he derives a meaning which is at least contributory to his self-image. He participates in nature, but as an independent being with both identity and culture: he is able to participate in such a way exactly because of his special capacities as a human being (his norms and values).
6. *Unity with nature*, sometimes referred to as *unio mystica*. The individually experiencing "me" falls away and merges into a nature which in this conception acquires an (immanent) divine character".

Most of current environmental policy is based on the *steward* position with as key word *sustainability*, that is, sustainable fulfilment of human needs (ibid.). The *enlightened ruler* and *steward* position do not bring anthropocentrism to an end: the human monopoly on values remains. Only in the *partner* position the intrinsic value of nature is recognized, and in the *participant* position an experience of solidarity with nature -participation on the level of meaning and sense- is emphasized. In the participant's position pursuing from within, rather than controlling from without, becomes important (ibid.). In the participatory basic attitude ecological spirituality is central: an immanent or 'horizontal' spirituality, which encompasses humans, animals, plants, things, eco-systems, the earth, the cosmos as a whole. This connecting aspect of ecological spirituality refers to a solidarity that *bridges the distance but maintains the difference* (ibid.). In ecological spirituality a dynamic balance between integrative and self-assertive tendencies is realized.

According to Zweers (1995a:57) the last basic attitude in Box 16 -*unity with nature*- can only be realized by few people. For the time being it is a utopia, but the basic attitudes 4 and 5 might be a pre-phase to this stage of true identification with nature. To my mind the mystical experience of *unio mystica* might indeed seem to be a far-fetched utopian ideal, but nevertheless it is an important goal worth striving for. The modern development in the discipline of philosophy -i.e., the decline of metaphysics- implies that no all-encompassing or intrinsic 'deeper' order in the universe exists. "In the combined wake of eighteenth-century philosophy and twentieth-century science, the modern mind was left free of absolutes, but also disconcertingly free of any solid ground" (Tarnas 1993:359). The instinctive hunger of the modern Western mind for cosmic coherence, for existential order, has not been satisfied by the dominant scientific world view and modern philosophy (ibid.:373). Hegel, for example, claimed the existence of a universal order accessible to human awareness, but without consensual validation of the claims of idealist philosophers, romantic poets, religious mystics, and countercultural psychedelicists the apparent incompatibility of their claims with the secular scientific mind -"the bottom line of modern belief"- remains problematic (ibid.:375). The modern existential condition can be characterized as an extraordinarily encompassing 'double bind' situation, which, because of its universality, is difficult to recognize (ibid.:420). Modern people are insignificant inhabitants of a vast and impersonal universe, which they cannot directly know in its essence. This situation is profoundly unintelligible since "our psychological and spiritual predispositions are absurdly at variance with the world revealed by our scientific method" (ibid.). The double bind's inherent contradictions are, on the one hand, people's quest for meaning and spiritual fulfillment, while on the other hand, science tells us that the universe is entirely indifferent to that quest. The unstable paradox that permeates the postmodern mind is that the critical deconstruction of any and all forms of 'metanarrative' implies that its own position -the historical-cultural relativity of all knowledge- does have no necessarily universal, extrahistorical value either. Precisely by virtue of its self-relativizing critical consciousness, compelled by its own logic, on its own terms, the postmodern mind cannot exclude the possibility of a comprehensive and coherent, universal and extrahistorical paradigm (ibid.:402). The contemporary intellectual situation is characterized by two antithetical impulses: a radical deconstruction and a radical integration. The underlying goal of Western intellectual and spiritual evolution, the deepest passion of the Western mind, has been:

> "*to reunite with the ground of its own being*. ... The *telos*, the inner direction and goal, of the Western mind has been to reconnect with the cosmos in a mature *participation mystique*, to surrender itself freely and consciously in the embrace of a larger unity that preserves human autonomy while also transcending human alienation" (ibid.:443).

Instead of emphasizing only the deconstructive aspect of postmodernism, a more constructive interpretation of postmodernism could entail the integration of (scientific and philosophical) reflection and (spiritual) experience, resulting in an (immanent) ecological world view (Zweers 1995a:8)[10].

A change towards a more ecological world view will be gradual, and requires a regular experience of oneness *along with* the equally real experience of diversity. This at first sight paradoxical statement can be further elaborated by referring to the concept 'high synergy system'. In a high synergy system each component is acting for itself *and* for the good of the whole: the good of the individual component *is* the good of the total system. "Biologically speaking the characteristics of a high synergy system are essentially the characteristics of a healthy organism" (Russell 1990:183). An outstanding example of a high synergy system is the human body: in a healthy body each cell functions to serve both its own needs and the needs of the body as a whole. As we will see later on, these so-called 'divergent problems' are quite common in human existence, and require a dynamic balancing of opposing tendencies (section 11.1). In these postmodern times the slogan 'think global, act local' is an example of a divergent problem. Another example is 'global market liberalization' versus 'local ecological integrity'. Especially for agricultural scientists 'a feeling for the organism'

10. Zweers (1995a:193) prefers the terminology of the *participant* position (interconnectedness or participation) to the terminology of the *unity with nature* position (holism or identification). The reason he gives is that an all-encompassing identification *seems* to contradict a relationship between different entities based on individual independence. Nevertheless, he acknowledges that the sixth basic attitude is not necessarily related to concepts such as subjection and domination. Human autonomy and unity with nature are no irreconcilable concepts as we will see later on. Distinction and separation are two different things.

seems indispensable[11]. Scientists need to be capable of empathic identification with the object under study (Keller 1983). Instead of creating a false sense of sustainability by neglecting negative side-effects in some parts of the eco-system Earth, the so-called externalities (Schiere 1995:19), agricultural scientists need to take care that anti-human and anti-environmental backlashes are as much as possible prevented. Since each farm is a holon (an independent unit *and* part of a larger agricultural system) farmers and scientists have to strike a dynamic balance between freedom and interconnectedness, between taking and giving, between satisfaction of human needs and respect for the intrinsic value of nature (Van Asseldonk 1988b).

With regard to Spinoza's *unio mystica* it is important to emphasize time and again that such an experience is only possible on an individual basis (section 8.1). As soon as we start striving for "spiritual togetherness with others" we bring in the Trojan Horse of religion (Vandiest 1996). As Krishnamurti said: "Never become the priest of another man's ideas". Where obedience rules, spirituality is excluded. True spirituality is gentle *anarchism*: it is nonviolent, quiet, calm, purely mental, but nevertheless intense (ibid.). Religion is institutionalized spirituality, spirituality is religion without institutions (Huston Smith:in Ten Dam 1996). Instead of religion, it might be better to speak of 'church' or 'faith' in order to emphasize the institutionalized character and the inherent holding on to a belief. Spirituality has to do with the original meaning of religion, i.e., *religare, religio*: to (re)connect to the field of transcendental consciousness. Regular contact with this level of consciousness will result in a *healing* form of spirituality. It is no coincidence that the words *holy*, *whole*, and *heal* are related to one another. In this sense also the concepts spirituality and holism are linked.

Other important concepts in environmental philosophy are anthropocentrism and ecocentrism. In reality, however, the philosophical debate between proponents of anthropocentrism and ecocentrism is a fake problem. Any human understanding of nature is anthropocentric, but man only becomes aware of his own centre through 'the other' to which he first must become receptive. In fact anthropocentrism and ecocentrism presuppose one another (Kockelkoren 1992:126). To my mind we have to go beyond anthropocentrism and ecocentrism in the experience of *unio mystica*, or -if that is too far-fetched- in the *participant* basic attitude. Only by transcending the duality, the 'problem' can be 'solved'. People always find themselves in a dialectical tension: they merge into nature *and* transcend nature. This existential schizophrenia is their inescapable fate: they have to live both simultaneously by realizing the paradoxical unity of immanence and transcendence (ibid.:138). Life is inherently ambiguous since people draw their own boundaries, but are also aware of this boundary-drawing activity (ibid.:207-8): it is a real divergent problem. In order to develop sustainable agricultural technology people's receptivity to the intrinsic meaningfullness of nature needs to be enlarged, an integral rationality must be realized. Sustainable science and technology keeps in touch with -tunes in to- the selfregenerating capacity of nature in order to stay within the boundaries of this capacity (ibid.:185). This requires (technical) engineers with an inherent sense of moderation. Both in the design phase and the application, technology is characterized by a disengaged *and* a receptive moment, which implies that engineers must maintain a balance between

11. The phrase 'a feeling for the organism' refers to Barbara McClintock, who was awarded a Nobel Prize for her work on genetic research in maize (Keller 1983).

indifferent objectivity and receptivity (ibid.:177). It is not a matter of either the one, or the other, but an integral rationality keeps them in balance[12].

Since life-processes play an eminent role in farming, and farming must be embedded in wider environmental concerns, it is evident that the concepts ‘basic attitude towards nature’ and ‘ecological spirituality’ have a role to play in the development of sustainable farming systems. In section 9.5 I will argue that sustainability is the emergent property of negotiated agreement and experiential spirituality. In this sense the development of sustainable farming systems and spirituality are linked. The issues raised in environmental philosophy are relevant to the industrialized world as well as to the problematic situation of resource-poor farmers in low income countries.

8.3 The pre/trans fallacy: regression and progression

The emphasis in this chapter on the importance of (ecological) spirituality does not imply that rational, discursive thinking should be abandoned. The continual identification with the rational-empirical consciousness, however, makes it difficult to establish an ecological ethic. The point is that the mode ‘thinking-being’ needs to be restored to its proper place in the spectrum of modes of being through a transcendence of the intellect. Vink (1987) indicates two possibilities for people to re-establish the experience of unity with nature: on the one hand *regression* to the feeling, on the other hand *transcendence* to a trans-rational experience of interconnectedness with everything that exists. The first romantic attitude of ‘back to nature’ can be considered as a regression to an earlier, pre-reflexive phase. People look for a new wholeness of life by rejecting the rational thinking as the ‘wrongdoer’, and return to an experience of wholeness in the feeling. This attitude of a romantic glorification of the past does not do justice to the factual development that took place during hundreds of years; it wants to turn back the clock. Such an attitude can even degenerate into fascism when people reject rational thinking in favor of a ‘Blut und Boden’ romanticism (ibid.). The advantage of the second alternative -transcendence of the intellect- is that rational thinking is not thrown overboard, but put at the service of a new consciousness in which unity is *directly* experienced. This results in *progression*, not regression. The concept (infantile) regression appears also in the discussion of the superficial similarity between mystical experiences and experiences of very young childhood (Russell 1990:144). The mystical state -*unio mystica*- is characterized by *differentiated union*: a simultaneous awareness of diversity and unity. An awareness of underlying oneness is added to the normal awareness of a distinction between the perceiver and the perceived: unity in addition to all diversity (ibid.:141). The state of young childhood, however, is one of *undifferentiated unity*: the distinction between the individual self and the rest of the world is not yet recognized.

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12. According to Kockelkoren (1992:177) technology displays characteristics of both instrumental *science* and relational *art*. He refers to the principle of ZEN-art: we do not make the piece of art, but IT takes place, IT develops. The gifted artist has realized the fusion of infinity and finity in daily life, he has unified the openness to the transcendental dimension with the expression of that dimension within the limits of space and time (ibid.:139). The artist must be a perfect ‘conductor’ or ‘guide’ for the meaning that seeks expression in matter. This requires, on the one hand, that the artist ‘empties’ or ‘opens’ himself in a meditation process, and on the other, that he perfectly masters the craft (ibid.). The same applies, in my view, to agricultural technology and agricultural scientists and farmers.

The confusion of infant consciousness with mystic union is an example of what Wilber (1985b:120) calls the 'pre/trans fallacy'. The pre/trans fallacy and the regression/progression distinction are summarized in Table 10. The evolution of consciousness proceeds from pre-personal (not-I) via personal (I) to trans-personal (not-I). Since for an untrained eye the pre- and trans-personal domains look practically identical, the two get easily mixed up. The pre/trans fallacy can work in either of two directions: the transpersonal is reduced to the pre-personal (pre/trans fallacy 1), or the pre-personal is elevated to the trans-personal (pre/trans fallacy 2). The above case is an example of a pre/trans fallacy 2: infancy, as a state of pre-subject/object differentiation and absence of ego awareness, is elevated to the level of mystic union in which the subject/object duality is transcended - a state of trans-subject/object differentiation.

Table 10: The pre/trans fallacy: regression and progression

Child	Adult	Enlightened adult
pre-personal	personal	trans-personal
sub-conscious	self-conscious	trans-conscious
pre-rational	rational	trans-rational
Sensory: pre-conceptual feelings	symbolic: conceptual arguments	spiritual intuitive: trans-conceptual insights
Instinct	reason	intuition,contemplation
Undifferentiated unity; no distinction and separation	emancipation; distinction and separation	differentiated union; distinction without separation

The two most important examples of the pre/trans fallacies 1 and 2 in psychology are successively Freud and Jung (ibid.:125). Freud interpreted mystic trans-personal union as pre-personal undifferentiated unity; a case of infantile regression. He did not distinguish between pre-personal *regression* and trans-personal *progression*. Jung, on the other hand, often confused pre-personal infant consciousness and primitive, mythical-magical images with mystic union. Also many New-Age writers get entangled in the pre/trans fallacy 2, and confuse pre-conceptual feelings with trans-conceptual insights (ibid.:132). Also the *participation mystique* of 'primitive' people in anthropological studies must be located in the pre-personal domain. The vague unity of the self and the group (clan, tribe), the self and nature, and the self and the animals makes a very transcendent impression (ibid.:141). In fact, however, there is no transcendence of the distinction between subject and object; this distinction simply did not arise yet. Such a *participation mystique* of 'primitive' people, or of our ancestors, is a pre-personal undifferentiated unity that is elevated to trans-personal union; a case of pre/trans fallacy 2[13].

13. Koestler (1989:243) speaks (in this context of regression and progression) of *identification* and *integration*. *Identification* with tribe, caste, nation, church or party -with a social holon- is regression to an *infantile* form of self-transcendence. It is crowd mentality: "it entails the readiness not only to kill but also to die in its name. ...*the*

I want to remark here that the position of the enlightened adult -a person who has realized ‘enlightenment’, who has permanent access to the field of transcendental consciousness- is the ideal of human development. An ideal, however, that has been realized by a minority of people throughout human history, and is therefore certainly not just a dream. Rather it is a realistic ideal worthwhile pursuing in these days of severe environmental problems. Visser (1996) discerns two major obstacles to a clear understanding of the role of spirituality, namely the current popularity of *holism* and *depth psychology*[14]. He argues that the ‘holistic’ tendency to proclaim a synthesis between science and spirituality, based on the insights of modern quantum physics, is premature. If quantum physics has discovered the unity of the material world, this does not imply that physics can say something about consciousness. Also Wilber (1985a:256) criticizes the ‘physics-supports-mysticism’ idea that is so popular in New Age circles. He maintains that although modern physics offers no positive support (let alone proof) for a mystical worldview, the world’s great physicists -Heisenberg, Schroedinger, Einstein, de Broglie, Jeans, Planck, Pauli, Eddington, and Bohr- all held a mystical-spiritual view of the world (ibid.:1985c:ix). According to the founders of modern physics their theories neither support nor refute a mystical-spiritual worldview. The present generation of orthodox scientists, however, who “bow to physics [the hardest of sciences] as if it were a religion itself”, should wonder *why* all founders of modern physics were *mystics* (ibid.:x). What does it mean that exactly through “a sustained use of the critical intellect .. these greatest of physicists felt absolutely compelled to go beyond physics altogether” (ibid.)[15]. One conclusion unmistakably emerges:

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self-assertive behavior of the group is based on the self-transcending behavior of its members... the egotism of the group feeds on the altruism of its members” (ibid.:251). War is not the result of aggressive self-assertion, but of self-transcending identification (Koestler 1989:253). Holocausts are derived from primitive *identification* instead of mature social *integration*. In an ideal society the self-assertive and self-transcending tendencies “would be harmoniously combined in its citizens - they would be saintly and efficient, yogis and commissars at the same time” (ibid.:241).

14. Jan Smuts, author of ‘Holism and Evolution’ (Macmillan, London, 1926), introduced the term ‘holism’. He may have been inspired by “the holistic worldview, prevalent among Africans” (Huizer 1995). Holism as a philosophy should be “explicitly related to the context of power contradictions of which it -implicitly- forms part” (ibid.). A painful point is then that Smuts was head of the South-African government. It is possible that Smuts got caught up in a pre/trans fallacy 2, and elevated pre-personal, naive *participation mystique* with nature and tribe to trans-personal, mystical union. I did not check on this issue, but it is certain that a truly holistic *differentiated union* -characterized by distinction without separation- is irreconcilable with ‘apartheids’ policies.

15. Physicists do not look at the ‘things in themselves’, at noumenon, at ‘reality’ itself, but at highly abstract, mathematical symbols of reality, at a *shadow world of symbols*, as Eddington put it (Wilber 1985c:8). Mystics, on the other hand, employ a *direct* and *nonmediated* approach to reality itself. Sir James Jeans says: “..we [the physicists] are not yet in contact with ultimate reality. We are still imprisoned in our cave, with our backs to the light, and can only watch the shadows on the wall” (ibid.:10). The general conclusion of the world’s great physicists is that physics cannot deal with ‘the light of reality beyond the shadowy cave’. The cave of shadows -the world of physics- is a partial aspect of ‘something wider’, says Eddington. According to these theorists physics can tell us nothing whatsoever about this ‘something wider’. “It was exactly this radical failure of physics, and not its supposed similarities to mysticism, that paradoxically led so many physicists to a mystical view of the world” (ibid.). The attempt to interpret consciousness in terms of the lower physical level -so that ultimately it can be measured and quantified- is ‘disguised’ (often subtle and hidden) reductionism: “claiming that all things are ultimately made of subatomic particles is .. the most reductionistic stance imaginable!” (ibid.:27). The attempts of many so-called ‘holistic’ New Age writers to ‘prove’ mysticism with modern physics are profoundly reductionistic. These attempts irritate orthodox philosophers and scientists -“not because these approaches are mystical but, to the contrary, because they are so reductionistic!” (ibid.:28).

> “At most, the new science demands spirit; at least, it makes ample room for spirit. Either way, modern science is no longer *denying* spirit. And that, *that* is epochal” (Wilber 1985a:4).

With regard to the second issue mentioned by Visser -*depth psychology*- it is unfortunate that Carl Jung placed religion and spirituality in the (personal and collective) sub-conscious. Apparently he, and most of his contemporaries, did not have access to the ‘trans-conscious’ and trans-personal field of transcendental consciousness[16]. It is evident that the position of the enlightened adult is difficult to grasp at the level of the discursive thinking. To be simultaneously an independent individual *and* a trans-personal ‘being’, self-conscious *and* trans-conscious, rational *and* trans-rational, and to experience yourself as a *differentiated union* with all nature is not easy to understand at the intellectual level[17]. The position of enlightened people is for non-enlightened persons a divergent problem par excellence.

Earlier on I have spoken about the difference between religion and spirituality (section 8.2). This distinction is important in order to understand the frequently troublesome relationship between science and religion. The relationship between science and religion in the past, present and future is given in Table 11.

Table 11: The relationship between science and religion in the past, present and future

Middle Ages	Present Western society	Future
- science and religion are an undifferentiated unity: no separation and distinction, science	- science emancipated: science and religion separated, independent science	- science and spirituality are a differentiated union: distinction without separation, unity-in-diversity

16. Jung’s discovery of the archetypally patterned collective unconscious was the result of empirical investigation of psychological phenomena. As Jung indicated himself these studies of the mind did not render knowledge of the world beyond the mind. Archetypes do not transcend the human mind (Tarnas 1993:424). In his later work, Jung saw archetypes as “autonomous patterns of meaning that appear to structure and inhere in both psyche and matter” (ibid.:425). With reference to the prefix ‘trans’ as used in Table 10, I want to remark that it refers to *transcending* and *going beyond*. Enlightened adults have transcended their ego-personality (trans-personal), transcended self-consciousness (trans-conscious), transcended the identification with the rational-empirical consciousness, with the discursive intellect (trans-rational), and transcended the phase of conceptual argumentation or dialectical debate (trans-conceptual insights).

17. Zweers (1995a:466) describes the process of individual self-realization (or growing up) in terms of a development from *unreflected unity* via *reflected separation* to *reflected union* or connectedness. At the collective level a similar process can be discerned: from a *pre-modern* phase with unreflected unity of man and nature (culture and nature), to a *modern* phase characterized by scientific-technological rationality and loss of unity with nature, to a *post-modern* phase characterized by a union of scientific-philosophical reflection and direct experience. Zweers refers to the direct experience of union with nature as ecological spirituality (ibid.:429). The second phase of individual growing up -*reflected separation*- is also described by expressions such as separation between self and world, individuation, emancipation, autonomy and freedom. This emancipation results, however, also in duality and alienation, in an existential double bind: the dialectic between the undifferentiated unity of early childhood and the subject-object dichotomy of adulthood (Tarnas 1993:433). Nevertheless, the Cartesian-Kantian dualistic epistemology is a necessary stage in the evolution of the human mind (ibid.:436). Other expressions referring to the third phase -*differentiated union*- are: spiritual liberation, spiritual rebirth, awakening, self-transcendence, psychological healing, synthesis, and reunification with Being (ibid.:chapter VII).

under church - pre-rational	- rational	of the knowledge quest - trans-rational

To my mind, the baby -spirituality- was thrown out with the bathwater -institutionalized religion- in the (laudable) separation of science and religion, which occurred after the Middle Ages. In this study ‘spirituality’ is understood as an individual, free, anarchistic, horizontal and above all *experiential* spirituality, which is not based on dogmas, but on self-help/do-it-yourself techniques to break the continuous spell of the rational-empirical consciousness. It is a spirituality which does not demand faith but experience. The emancipation of science to an ‘authority’ independent from any form of institutionalized religion (churches) is an important achievement of modern society, and a *regression* to Medieval conditions is absolutely out of the question. However, in modern society many people lack access to the field of transcendental consciousness, they do not directly experience spirituality. In the following chapters I will argue that a *progression* to a differentiated union of science and spirituality is necessary.

In agricultural practice one requires besides technical knowledge and skill, also insight of a different kind - societal (economic, political, and cultural) insight in the world in which we live (Koningsveld 1986a). Our knowledge in this area -the area of *wisdom-* is still underdeveloped, and as a consequence our competence to take *wise* decisions in daily practice is not particularly well-developed. A growth in wisdom entails not only a rationalization at the technical level, but also at the social and political levels. The one-sidedness of the rationalization by the classical agricultural sciences must be lifted (ibid.). In recent history the development of science and technology pushed religious and political world views off their dominant position, so that they no longer could provide guidance in daily practice. At the same time, however, science claimed that it could not give an answer to ethical, religious and political questions. Answers to normative questions -which are indispensable in practical action- were declared beyond the reach of science. The vacuum thus created was filled with a chaos of ‘personal decisions’ - mostly driven by self-interest. In this way the development of technology got the opportunity to become an apparently autonomous power with its own dynamics (ibid.).

Koningsveld’s proposal to formulate an agro-system theory (‘theoretical integration’: section 7.3) probably will encounter fierce, dogmatic opposition from the dominant scientific paradigm, because we seem to end up in an inextricable mingling of scientific-technical and societal-normative matters. But it is exactly the fact-value dualism, as part of the dominant scientific paradigm, which could be contributory cause to our ignorance (unwiseness, irrationality) at the economic, political and cultural levels (ibid.). Precisely this dualism seems to have contributed to the fact that normative matters are no longer topic of thorough scientific reflection in our culture. This dualism, therefore, cannot be considered ‘a sacred cow’ and should at least hypothetically be suspended in order not to frustrate the formulation of an agro-system theory, in which the object of research is the question what the function of agriculture *should be* (ibid.) (this refers to the design process: section 1.2). This research implies normative steps which are not reconcilable with a watertight barrier between facts and values. As long as agricultural science simply accepts *that* function of agriculture as politics has defined it -mind you: also a normative position- agricultural science will be overtaken by events. It deprives itself of the ability to anticipate disastrous facts -such as overproduction and environmental pollution- and thus to criticize prevailing norms (ibid.)[18]. On the other hand, the fact-value dualism (science-politics) is one of the most important normative attainments of our culture. Especially in our technocratic society, in which practical problems with a normative or political dimension automatically are translated into technical questions, the defence of this dualism is a matter of the highest importance (ibid.:1987b)[19]. Science is (or at least should be) characterized by anti-dogmatism, which implies that it should criticize those norms and values that are not defended on the basis of arguments but with other means. This critical function of science and the fact-value dualism are perfectly well reconcilable in the sense that science can contribute to a rationalization of politics by means of a scientific debate on the interpretation of social phenomena in the agricultural system (ibid.:1987b, 1987c). Resolving this permanent interpretation debate in an other way than through rational consensus is not scientifically justified, and leads irrevocably to dogmatism, says Koningsveld.

According to Koningsveld (1987b) a re-education of politicians and scientists is needed in order to achieve a consensus on societal rationality. The interaction between (agricultural) politics and (agricultural) science must develop towards an ideal situation in which a true democracy anticipates a mondial society, and genuinely independent science and true democracy presuppose one another (ibid.). The main question is then *how* to re-educate politicians and scientists so that they become wise men with insight in societal rationality and with a holistic perception[20]. A possible answer to this question might be found in the application of the concept 'pre/trans fallacy' to the discussion of the fact-value dualism. The current scientific position -a separation of facts and values- is called rational. A regression to a situation in which facts and values are decided upon by 'the (political) authorities' can be called pre-rational. A progression to a situation *beyond* the fact-value dualism can be called trans-rational: this trans-rational progression entails distinction *without* separation of facts and values (in Table 11 the relationship science-politics or fact-value can substitute the relationship science-religion). The re-education of politicians and scientists entails therefore a *transcending* of the fact-value dualism - a dualism which is simultaneously contributory cause to our unwiseness *and* an important attainment of Western culture. Such paradoxical situations cannot be 'solved' by logical reasoning alone: divergent problems, it will be argued later on, can be transcended by the infusion of a non-dual element -transcendental consciousness- into the field of dualism (section 11.1). In Koningsveld's keen writings the predominance of the mode 'thinking-being' or the identification with the rational-empirical consciousness is obvious. He has a strong *belief* in the capacity of the human intellect to solve problems through discursive thinking, which in the end will result in societal insight or wisdom. In my opinion the current 'borderline'

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18. Another disastrous development might be the genetic manipulation of crops and animals, which seems already to be accepted by the political establishment.

19. Examples of this translation-automatism or 'technological fix' are questions concerning the welfare of farm animals which automatically are translated into technical problems of pen-size per animal. The practical problem with regard to manure surpluses in The Netherlands is translated into the technical questions how to develop feed with nitrogen and phosphorus compounds that are easier assimilated by animals, or how to design a manure-processing factory (Koningsveld 1991).

20. To my mind Koningsveld is not answering this question. If one argues that the re-education of politicians and scientists will take place gradually by the development of an agro-system theory, then one ends up in a circular argument. It is obvious that 'ideal' scientists and politicians are a prerequisite for an 'ideal' relationship science-politics.

problems or crisis situations (section 7.3) indicate, however, that the intellect cannot cope with the fact-value dualism. It is my *belief* that a supplementation of intellectual reasoning with regular access to transcendental consciousness stands a better chance of generating wisdom[21]. To my mind scientists with regular access to transcendental consciousness will be more qualified participants in the scientific debate on societal rationality.

8.4 Different modes of knowing

In order to further clarify my position on spirituality I have to labor a bit more on the word 'spirit' because it is extremely difficult to discuss the realm of spirituality without involving paradox. Spirit itself is not paradoxical: "it is, strictly speaking, beyond all characterization and qualification whatsoever" (Wilber 1985c:15). It is prior to *any* form of conceptual elaboration. The notorious, and unavoidable, paradox is that spirit is both *transcendent to* -and *immanent in*- the world. We have to include both sides of the paradox in our verbal formulations: spirit transcends everything *and* includes everything. Spirit is "both the highest level of reality *and* the condition or real nature of every level of reality. It is the highest rung on the ladder, *and* it is the wood out of which the ladder is made" (ibid. 1985a: 254). One half of the paradox is hierarchy, the other half is that all things are already spirit. On the one hand, spirit is the Summit of all realms; on the other hand, it is the Ground of all realms, the 'suchness' or 'isness' of all realms. Following Wilber (1985c:17) I will write 'spirit' with a small 's' when I refer to spirit in its transcendental aspect, and 'Spirit' with a capital 'S' when I refer to the immanent aspect. Since the immanent aspect of Spirit is all-pervading and all-inclusive, there is no place outside it from where you could 'objectively' describe it (ibid. 1985a:265). In order to approximate the one universal Ground intellectually, people create (socially-constructed and historically-situated) interpretations. However, only the Ground itself and its direct experience -*before* all interpretation and deeper than all interpretation- remain unchanged (Van Ruysbeek 1996). The putting into words of this experience -a map again- will differ (section 8.1). The most pervasive and obvious difference between scientific paradigms and mystical experiences is that the first are mental constructs, while the latter imply actual transcendence of all *contents* of the mind (Wilber 1985a:170). "Scientists are mapmakers and the mystical experience is part of the territory" (Weber 1985).

In a simple three-level hierarchy we can distinguish three realms of *being*: matter, mind and spirit, with three corresponding modes of knowing: sensory, symbolic and intuitive (Wilber 1985a:256, 1985b:117)[22]. Since the mind cannot only look at its own level but at the other two levels as well, we have then in total five different modes of knowing (Diagram 11). Mode number 5 is simple sensory-material perception. Number 4 is empirical-analytic mental knowledge, or mind's

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21. In principle there is no reason why one *belief* would be better than the other. As we will see later on, however, my *belief* is supported by an internally consistent theoretical framework -the transcendentalist paradigm- which encompasses earlier paradigms, and also by scientific work that clearly shows the beneficial individual and collective effects of engagement in methods for consciousness development - the main methodology of the transcendentalist paradigm. On the other hand, we have seen in section 6.2 that the positivist paradigm is not internally consistent, while the operationalization of constructivist-oriented methodologies poses serious problems.

22. Also Blans (1996) -referring to Pascal and Augustinus- gives a similar three-level hierarchy.

ideas about the sensory-material world. This is the dominant mode of knowing in the positivist paradigm. Number 3 is hermeneutic and introspective knowledge, or mind's knowledge about mind. Mode number 3 is an important method in the constructivist paradigm, although constructivists also can employ empirical-analytic methods. Number 2 is paradoxical reason, or mind's attempt to *think* about spirit. It is called paradoxical reason, because the mind necessarily generates paradoxical statements when it attempts to think about the spiritual domain. As we have seen above, spirit/Spirit is *simultaneously* transcendent and immanent, and therefore the spiritual domain is *nondual*[23].

> "..paradox is simply the way nonduality looks to the mental level. .. when the mind tries to think about [the spiritual domain] then nonduality shows up as two contradictory opposites, both of which can be shown to be equally plausible because neither is complete by itself. The best you can do therefore is affirm *both* sides of the duality...(which) gives you paradox" (Wilber 1985a:274).

Number 1, finally, is spirit's *direct* knowledge *of* spirit, which is non-mediated and nonsymbolic knowledge, it is intuitive. As we will see later on, mode number 1 is an important method in the transcendentalist paradigm.

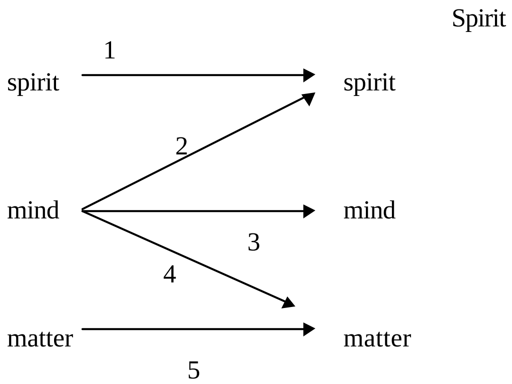

Diagram 11: Five different modes of knowing (Wilber 1985a).
Three realms of being result in five modes of knowing. The immanent aspect of Spirit (capital 'S') is represented by the paper on which the diagram is drawn.

The paradoxical nature of spirit/Spirit is exemplified as follows in Diagram 11: the all-pervading, immanent Spirit (capital 'S') is represented by the paper on which the diagram is drawn, while the transcendent aspect of spirit (small 's') is transcendent to, or different from, the realms of matter and mind. Each higher level in Diagram 11 transcends but includes the lower levels. Or in other words, each higher level is synergistic to its lower levels, it includes them but is more than them, it is more than the sum of the lower levels. Each higher level is 'emergent', 'creative', 'novel', 'transcendent' (Wilber 1985c:26). Mind or spirit cannot be reduced to matter, to the biophysical

23. In a real paradox two mutually contradictory occasions occur *simultaneously* and *equally*. A subatomic 'event', for example, that in one situation acts as a particle and in another as a wave is not a real paradox, but a complementarity. It never acts as a particle and wave simultaneously (Wilber 1985a:283). Most (apparent) paradoxes in science probably are indications of sloppy thinking, not transcendental reason (ibid.:285).

substrate of the brain, or be explained entirely by brain physiology. Likewise, life is synergistic in reference to matter (ibid. 1985a:277)[24]. If agriculture is defined as the technical transformation of *living* material in desired plant and animal products -a transformation in which *life* processes play an essential role (Koningsveld 1986b)- then farming and agricultural research cannot do otherwise than acknowledge the emergent and transcendent character of *life*.

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24. Says Chopra (1991:75,76): "Science has yet to recognize that DNA has a magical side. ... How is it, then, that stubborn, inert molecules learned to build a staircase many million times more complicated than any constructed by human hands? The answer is that DNA is not really a thing; it is a living memory residing in a thing. The memory is not intrinsic to the component carbon, hydrogen, or oxygen atoms. If it were, then a sugar cube would be alive, too. DNA is basically a material mask behind which one finds a rich but abstract awareness". He continues: "We equate life with DNA molecules, ignoring the fact that a person's DNA is just as intact the second after he dies as the second before" (ibid.:80). Also Koestler (1989:54) is of the opinion that the phenomenon 'life' (consciousness included) cannot be reduced to and explained by physico-chemical laws.

Schumacher (1977:18) distinguishes four levels of being -minerals, plants, animals, and people- which differ from each other through the powers of life, consciousness, and self-awareness. He says: "..it is outside our power to give life to inanimate matter, to give consciousness to living matter, and finally to add the power of self-awareness to conscious beings. ... Evolution as a process of the spontaneous, accidental emergence of the powers of life, consciousness, and self-awareness, out of inanimate matter, is totally incomprehensible". According to Schumacher (ibid.:21) there are *differences in kind*, and not simply *differences in degree*, between the powers of life, consciousness, and self-awareness. Because of these 'emergent' properties we have never, and will never find the 'missing link' between animals and people (ibid.:18, Wilber 1985c:26). In organismic philisophy, however, *all* nature is seen as alive: there are only *differences in degree*, no *differences in kind* between the organizing principles of living organisms and molecules (section 7.2). For a more detailed discussion of the theories of Maturana & Varela, Sheldrake and Capra I refer to footnote 1b in chapter 6, and footnotes 3-7 in chapter 7.

To my mind it is evident that in the end all living beings are composed of atoms and molecules, but they are not 'nothing than' atoms and molecules. A non-material, irreducible organizational pattern makes them alive. This irreducible organic unity gives them identity and creates autonomous self-organization. The Indian philosopher Maharishi Mahesh Yogi refers to this intelligent organizational pattern as the *field of creative intelligence* which underlies all nature, including people. People have access to this field of creative intelligence through their own consciousness: when they experience the field of transcendental consciousness they are at home in the field of creative intelligence. In the terminology of the paradoxical spirit/Spirit dichotomy the field of creative intelligence is immanent in the sense that it underlies all of creation. And the fact that one has to transcend all contents of the mind in order to reach this field of transcendental consciousness refers to its transcendental aspect. The field of creative intelligence is simultaneously *immanent in* -and *transcendent to*- the world. From the *immanent* point of view there are only differences in degree, no differences in kind, since the same field of creative intelligence underlies everything. A stone and a (Rolling) Stone are both expressions of creative intelligence. Creative intelligence expressed in the 'dead' form and color of a stone, and creative intelligence expressed in the 'lively' music of a Stone. Or, in other words, vibrations of creative intelligence 'frozen' in the form of a stone, and vibrations of creative intelligence exploding in the dynamic music of the Greatest Rock & Roll Band on Earth. From the *transcendent* point of view, however, there are (obvious) differences in kind between stones and Stones. The first do not play music and do not fill stadiums with people all over the world; they are just non-rocking stones. The latter are an extraordinary species of the human race with an ability to transcend cultures through their music, and with a capability to transcend their own activity and thinking (this is in fact what great artists do). A stone and a Stone are on *different* levels in Diagram 11, but on different levels *of* being or creative intelligence. Or, in other words, a stone and a Stone can be vertically distinguished but not radically separated, since both are horizontally interconnected. There is transcendence *and* immanence. In short, a paradox which remains difficult to comprehend at the intellectual level.

It seems to me that positivist science tries to deny the 'miracle of life'. Through genetic engineering and sophisticated biotechnology people attempt to control life as if 'life' was not an emergent property.

It is important that we do not confuse mode number 2 with mode number 1. Immediate, nonconceptual insight can be born in the gap between thoughts, when the mind shuts up, when the inner talk stops (ibid.:270). Spirit can only be *directly experienced.* When one only *talks* about the spiritual domain assisted by the intellect, one develops a mere *concept* of this domain. Without a *method* to experience this domain, one easily ends up in making category errors. Such category errors in which the different modes of knowing become hopelessly confused, must be avoided (Wilber 1985b:40). Mode number 4 -the empirical-analytic methodology of orthodox science- *cannot* rise to the modes 3 and 2 - the mind's knowledge about the domains mind and spirit. This is the great problem of psychology and philosophy. When one expands the empirical-analytic methodology over these modes, the result is disguised reductionism (Wilber 1985a:271). Schumacher (1989:254) holds a similar opinion with regard to economics. The theories formed in the modes number 3 and 2 cannot be checked by empirical-analytic means. The verification of mode number 3 is not empiric, but hermeneutic; it can be verified in a community of *intersubjective interpretors*. Mode number 2 can be verified by neither empiric nor hermeneutic procedures; only by awakening mode number 1 paradoxical statements can be verified. The verification of meditation practices can take place in a community of *trans-subjective meditators* (Wilber 1985a:282). I must emphasize here that verification of mode number 1 cannot be done by 'objective' positivist research methods, nor by intersubjective, constructivist-oriented dialectical debates, but only through trans-subjective techniques for consciousness development (see also footnotes 15 & 16 in this chapter). The quality of the hermeneutic test in psychology and philosophy depends upon the quality, the caliber of the community of interpretors. One deals with subjective truths in the sense that they apply to the *subjective realm*, but that does not imply mere individual whim or wishful thinking. The truths must be *tested* in a community of like-minded interpretors (ibid.). All domains in Diagram 11 are open to investigation by the scientific method. The scientific method applies to all those knowledge-claims that are open to *experiential* validation or refutation, as opposed to non-testable, dogmatic proclamations (ibid. 1985c:14). Also the domain of spirit is open to *experiential* disclosure since spirituality is testable. Just as mathematical knowledge can be confirmed or refuted by equally trained mathematicians, spiritual knowledge can be checked with equally trained peers, i.e., persons trained in meditation techniques (ibid.:20)[25]. Also in 'orthodox' science we accept that only in principle we can duplicate experiments. For the acceptance of, for example, the theories of atomic physics "we do not ask that we all have a billion dollar cyclotron in our back garden, but put

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25. Schulte (1984a) quotes Aurobindo who says: "...most spiritual experiences of any value, cannot be brought before the tribunal of the common mentality which has no experience of these things and takes its own absence or incapacity of experience as a proof of their invalidity or their non-existence. ... even there (in the natural sciences) a training of capacity is needed before one can truly understand and judge: it is not every untrained mind that can follow scientific truths or judge of the validity either of their result or their process. ... in fact all man can have a spiritual experience and can follow it out and verify it in themselves, but only when they have acquired the capacity or can follow the inner methods by which that experience and verification are made possible".

Ransijn & Schulte (1982:288/289) argue that without microscopes cells and atoms would probably still have been unknown and mysterious things, simply because they are not within reach of our coarse sensory perception. The same applies to more refined, silent levels of consciousness: when our inner perception is not methodically refined, these stay out of our range of experience. This does not imply, however, that these more silent levels of consciousness do not exist, or are in principle not open to human experience. Pure consciousness does not exist for us as long as we do not experience it, in a similar way as colors do not exist in the country of the blind.

our faith in ... authorities in the field" (Russell 1990:160). In fact it is easier for laymen to verify the possibility of access to 'higher' states of consciousness, and the beneficial effects thereof, than to test the claims of atomic physics.

In principle there is no conflict between science and religion, but only a battle between *genuine* and *bogus*, between *experiential* science and religion versus *dogmatic* science and religion (Wilber 1985c:21). If 'science' is the study of the levels of matter and mind, and if 'religion' refers to an approach to the level of spirit, then the battle between genuine and bogus appears on every level. There is a unity-in-diversity of the general knowledge quest: a unity in methodological criteria (the method), underlying a diversity in objects (the domains) (ibid.:23). An overall paradigm must encompass all modes of knowing, including mode number 1. The human quest for knowledge entails the 'subjective' as well as the 'objective' realm (the difference between these two general categories might only be gradual) (see also footnote 24). A combination of 'subjective' and 'objective' approaches might result in a holistic perception[26]. With regard to the scientific nature of meditation techniques one can argue that inner, subjective experiences which do not make possible - in a systematic way- repeatable experiences of a stable, unchanging and to every human being accessible inner condition, can, strictly speaking, be denied a scientific character (Schulte 1978:60). Concrete methods for development of 'higher' states of consciousness and refinement of perception must meet the important criterion that a method should transcend its *own activity* in order to make it possible to reach the level of pure consciousness, where thinking or *inner talk* makes place for *inner silence* (ibid.:1984a). A method that does not transcend thinking will not be universal, but always be subject to intellectual, emotional, political and other limitations of the person in question (Ransijn 1983a). To the interested and motivated 'seeker' many methods and techniques to establish contact with the spiritual dimension are available. The selection of a particular method is a personal choice mainly guided by cultural background and personality factors. Scientific research on the individual and social *effects* of techniques practised to establish 'higher' states of consciousness, provides circumstantial, indirect evidence for the existence of transcendental and collective consciousness factors (we will return to this topic in section 9.4).

A recent study in the field of cognitive psychology speaks of the 'embodied mind': the mind is no longer seen as a rational deliberator, but as an 'adaptive responder' (Clark 1997). The mind is part of a body, or organism, that survives through effective action. Thinking is effective action in the domain of existence. Brain, body, world and artifacts are locked together. Clark (ibid.), however, does not refer to the possibility of a transcendental consciousness. The 'adaptive responder' remains locked in the rational-empirical consciousness.

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26. Ransijn (1985a:59) says: "Knowledge is reliable when it is independent of the changing emotions, moods and biases of the observer. Observations can be standardized, objectified and refined with objective means, such as microscopes, telescopes and statistical tests. But the observer can also, via subjective methods such as meditation, attain a stable state of consciousness, in which knowledge is not dependent on varying emotions etc. Hitherto, Western science has mainly made use of objective means to improve the ability of perception". And Russell (1990:156) remarks: "If knowledge is to be complete then a synthesis of these two approaches [the objective and subjective approach] is required: a synthesis in which neither approach compromises the other but both coexist together as two separate aspects of a single holistic path of knowledge".

8.5 Conclusion

The conclusion is that we learned more about F: the (implicit) frameworks of ideas and concepts underlying FSR theory and modern science have been explicated. The metaphysical background of FSR -the *mode of being* underlying FSR theory and practice- has been explicated. We have seen that a continual identification with the rational-empirical consciousness, i.e., *thinking*-being, underlies both the positivist and constructivist paradigms. The step-by-step learning process to go beyond this identification with the rational-empirical consciousness can be referred to as spirituality. Spirituality is thus the process in which one *systematically* trains the receptivity to gain *regular* access to transcendental consciousness. This can be done through, for example, meditation techniques. Various scholars claim that spirituality gives way to participatory *modes of being,* which result in environmentally and societally favorable behavior. Ecological spirituality refers to an *experience* of a fundamental, meaningful solidarity with nature -simultaneously preserving human autonomy and transcending human alienation- and is part and parcel of a more general spirituality. Later on I will argue that spirituality facilitates the development of sustainable farming systems (section 9.5). In a constructive, post-modern integration of scientific-philosophical reflection and spiritual experience an (immanent, horizontal) ecological world view and ethic can emerge. In order to overcome the social dilemma of common property resource management both individual experiential spirituality and negotiated agreement resulting in collective rational morality are needed.

Transcendence of the intellect does not imply that rational thinking is thrown overboard; it is only restored to its proper place in the spectrum of *modes of being*. Instead of only *thinking*-being, the experience of just *being*, of *consciousness-as-such* is emphasized. The danger of regression to pre-personal and pre-rational phases of human development is acknowledged, but in chapter 9 I will argue that experiential spirituality can only result in progression. In this context the difference between religion (churches, faith) and spirituality is important. Spirituality is in this study understood as an individual, free, anarchistic, horizontal and above all *experiential* spirituality, which is not based on dogmas, but on do-it-yourself techniques to break the continuous spell of the rational-empirical consciousness. It is unfortunate that in the (laudable) separation of science and religion, which occurred after the Middle Ages, the baby (spirituality) was thrown out with the bathwater (institutionalized religion). The loss of power by religion and politics resulted in the fact-value dualism. This paradoxical dualism -a dualism which is simultaneously contributory cause to our unwiseness *and* an important attainment of Western culture- can only be transcended in 'higher' states of consciousness[27]. In the resulting trans-rational progression facts and values can be distinguished without being separated. The scientific debate on societal rationality demands participants who can handle such paradoxes. Since spirit is both *transcendent to* -and *immanent*

27. Cees Veerman (1997), chairman of the board of governors of the Knowledge Center Wageningen, speaks of paradigmatic short-sightedness in contemporary science, and the importance of choosing for self-willed roads to future development. He speaks of doubt concerning the positivist scientific paradigm, doubt which creates room for alternative visions on the structure of reality and the 'true' sources of our knowing: knowledge in the sense of insights received or truths witnessed, whether or not in higher states of consciousness, he says.

in- the world, spirituality also displays a paradoxical character. This makes it necessary to indicate clearly to which aspect of spirituality one refers.

In a three-level hierarchy with three realms of *being (*matter, mind and spirit) five different modes of knowing can be distinguished. It is important that these modes of knowing are not mixed up. A common category error is to confuse thinking and talking about the spiritual domain with direct, non-mediated experience of this realm. This underlines the importance of practical *methods* to experience the field of transcendental consciousness. Another category error is to apply the empirical-analytic methodology to the domains of mind and spirit. All domains, however, are open to investigation by the scientific method: a method which applies to all those knowledge-claims that are open to *experiential* validation or refutation, as opposed to non-testable, dogmatic proclamations. Just as mathematical knowledge can be confirmed or refuted by equally trained mathematicians, spiritual knowledge can be checked with equally trained peers, i.e., persons trained in meditation techniques. Therefore also the domain of spirit is open to *experiential* disclosure.

From the four main issues selected in section 5.2 -holism, interdisciplinarity, attitudinal factors, and lack of countervailing power- the issues holism and attitudinal factors have become more transparent in this chapter. The concepts *ecological spirituality* and *basic attitude towards nature* have been introduced. A *healing* form of spirituality (the words *holy*, *whole*, and *heal* are related) is required. The position of the enlightened adult who experiences *differentiated union* with nature, is, in principle, accessible to most people. But, in order to realize this potential a shift in priorities (and thus time investment) is required, away from a single reliance on the empirical-analytic method towards a more holistic approach - an approach which includes methods for consciousness development, and which results in insight in societal rationality (wisdom).

In chapter 6 a characterization of the positivist and constructivist paradigms has been given. In the chapters 7 and 8 the contours of an emerging 'new' scientific paradigm can be detected. In these last two chapters various fields of science have been used, which makes that the new paradigm is rooted in existing theories, which forms part of its scientific justification. In the next chapter the new paradigm will be explicated. First, however, I will introduce a holistic framework for the multi-dimensional development process, since FSR always operates within the context of wider rural development efforts. The framework and the related transcendentalist paradigm hopefully will shed more light on the four main issues.

9 THE TRANSCENDENTALIST PARADIGM

9.1 A holistic framework for multi-dimensional development: different categories of factors

Development is a multi-dimensional process which involves, in addition to economic growth, major changes in social structures, popular attitudes and national institutions (Todaro: in Nickel 1989:108). In short, also comprehensive socio-cultural changes are needed (sections 1.2; 2.3; 4.5; 5.1 & 7.3). Moreover, full control of the development process is not possible (Dorward 1986b; Grandstaff et al. 1987; Scoones & Thompson 1994a; see also my last predisposition in section 1.4). Development is a process which is characterized by as many unanticipated as anticipated consequences (Hyden 1980:260). Since the large majority of the population in East Africa is living and working at the countryside, rural development is the key factor. Agricultural research in general, and FSR in particular, has a role to play in this unpredictable development process. The assumption of Anglophone FSR (which is the type of FSR practised in EastAfrica) is that small changes in a subsystem will affect the farming system as a whole and ultimately the regional system "so that, miraculously, development is brought about" (Fresco 1986:219). A focus on a single subsystem, however, can never be sufficient. The impact of research will be limited if economic and political constraints at other levels in the hierarchy are not lifted (see Diagram 4 in section 2.4; section 4.3.3; section 5.1- operational problem 1). Technical improvements constitute only a necessary, not a sufficient condition to agricultural development. A *mix* of conditions should be in place to bring about rural development. The question is then *how* in the diverse farming systems of East Africa *synergy in the mix* can be created (sections 4.3.3 & 4.4.7). In Fresco's (1986:38) opinion we must look beyond farming systems research to a more encompassing approach, which can integrate results of analyses carried out at different levels and by different disciplines. Huijsman & Budelman (1996) advocate a merging of systems research and social actor approaches (section 6.2). As the need for concerted action among actors in the rural development process becomes ever more evident, it is important to realize synergies between actors and approaches in order to make use of their possibilities for 'hybrid vigor' (ibid.). The merging of *positivist*-oriented 'hard' systems research and *constructivist*-oriented social actor approaches is not easy to realize (section 6.2). In this chapter I will argue that the *transcendentalist* paradigm can facilitate the development of an encompassing approach: an approach which not only includes the previous two paradigms, but also focuses on the underlying basis of 'hard' and 'soft' methodologies, i.e., the consciousness factor.

The claim of FSR to be a holistic approach to agricultural research proved difficult to sustain in actual field situations: problems of different categories (technical, socio-economic, and cultural) and different levels (farm level, regional level, etc.) are not tackled simultaneously (section 5.1:operational problem 1). A conceptual framework for the multi-dimensional development process could help to put FSR activities into perspective, and could facilitate the integration of different categories and levels. In order to provide a broadening conception of reality I postulate a framework with 8 categories of factors (see Diagram 12: adapted from Ransijn 1985a). The different categories in the framework are interrelated; they can be *distinguished* but not *separated*. Although the categories are interrelated, they are not equally fundamental.

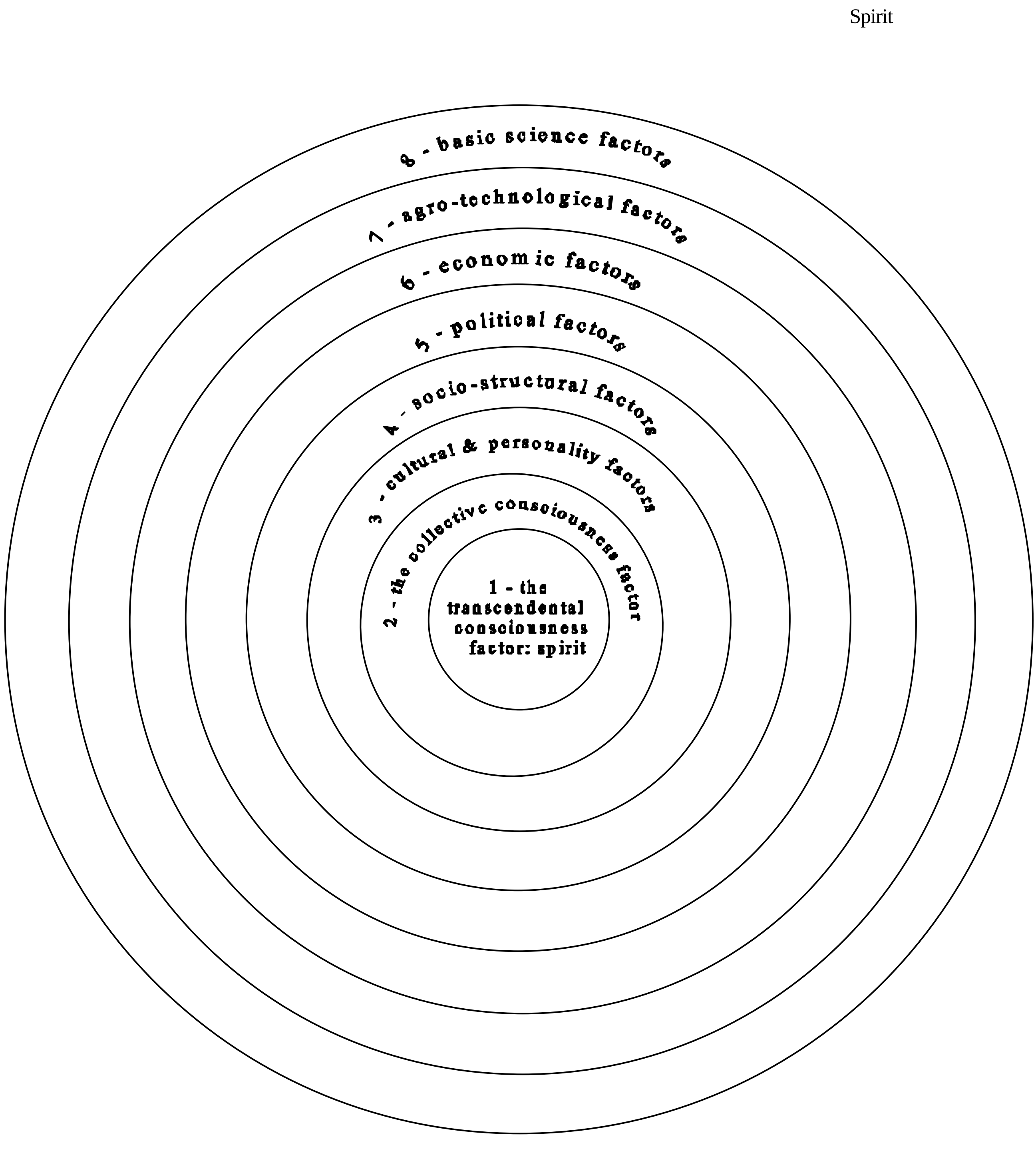

Diagram 12: A holistic framework for multi-dimensional development
The eight categories of factors are interrelated, but the inner categories carry more weight. The immanent aspect of Spirit encompasses all categories and is represented by the paper on which the diagram is drawn.
(adapted from Ransijn 1985a)

In this interdependent totality the factors in the more *inner* categories (the consciousness factors) are the more independent variables, while the factors in the *outer* categories are the more dependent variables (*inner* refers here to the fact that consciousness generally is perceived as an 'inner' factor, and it refers to the inner side of Diagram 12, while the more *outer* categories usually are not considered part of people's 'internal' life, and are located at the outside of Diagram 12). Moving from the outside to the inside in Diagram 12, from category 8 to category 1, one can say that the categories become more encompassing, more inclusive (Ransijn 1985a:46). The decision to use a certain agricultural technology, for example, is largely determined by economic factors. Economic factors, however, are strongly dependent on political factors. To date the main issue in politics is economics. One can say that politics encompasses economics, but economics does not encompass politics. Political factors in turn are determined by socio-structural factors, and so on and so forth. Whereas feedback relations exist between all categories, the more inner categories comprise the more outer ones and are, therefore, more important and essential. The various categories are related to one another in a kind of hierarchical order in which the inner categories carry more weight. The concept of a multi-layered hierarchy features also in Koestler's theory of holism (section 7.2). His Janus principle -a dynamic polarity of self-assertive and integrative tendencies- implies here that the various categories have a certain autonomy, but simultaneously are part of larger wholes. I want to emphasize here that all factors have a role to play in the process of rural development. The hierarchy is not absolute, rather it is a matter of being more or less 'encompassing'[1].

Hitherto, FSR mainly paid attention to the categories 7 and 6. Often an agronomist and agricultural economist were the first two members to be appointed in FSR teams in East Africa. Category 5 (political factors) is occasionally mentioned in literature, but never became a real issue in FSR field situations. The categories 4 and (partly) 3 recently have become more prominent, at least in literature on rural development. A publication like 'Putting People First' (Cernea 1991) demonstrates the centrality of sociological and anthropological analysis for development. In field situations, however, the neglect of social and cultural dimensions continues. The delineation of recommendation domains can serve as an example of the predominance of agro-technological factors in FSR. Frequently, only agro-ecological characteristics -soil type, rainfal pattern or main crop cultivated- are used in zoning exercises. Sometimes agro-economic characteristics, such as farm size or ownership of oxen, are used. Rarely, however, socio-cultural characteristics are employed to delineate recommendation domains (section 5.1: operational problem 10; section 2.4: Diagram 4). Personality factors (part of category 3) are not considered in FSR activities. Although for interdisciplinary collaboration in multidisciplinary FSR teams personality factors often are pivotal (section 5.1:operational problem 15), and active farmer participation demands 'participatory' personalities with researchers and extensionists (section 5.1: operational problem 3), psychology as a discipline remains largely absent in rural development literature. Whereas the centrality of the

1. One can also use the metaphor of Russian puppets, in which one puppet is enclosed by the next larger puppet (personal communication: Röling 1998). In 'the web of life' (Capra 1996) the 'hierarchy' of factors is a social construction for analytical purposes (see also footnote 7 in chapter 7). Nevertheless, I want to recall that 'one half of the paradox is hierarchy, the other half is that all things are already spirit' (section 8.4). See also footnote 24 in chapter 8: the various categories of factors can be vertically distinguished but not radically separated, since all are horizontally interconnected (see also Dossey 1989:9).

'human factor' in rural development is beyond doubt -"effect can usually only be achieved *through people*"(Röling 1988:18)- surprisingly enough little emphasis is placed on this key element[2].

The rural sociologist Van der Ploeg (1994) sees the methodological approach labelled *styles of farming* as a (necessary) 'step backwards' towards classical agronomy - an agronomy in which the empirical diversity of farming and its socio-cultural construction were central[3] (see also sections 3.4 & 7.3).

> "Farming emerges as a *social construction*: as a coherent, multi-dimensional constellation, in which the unity and synergy of practices, internal and external relations, knowledge, norms, opinions, experiences, interests and perspectives are more striking than the tensions and contradictions... Culture is encountered in the *specific coordination* between internal and external relations, between experience and perspective, between past, present and future. Culture is not a phenomenon 'outside' the so-called 'hard realities of market and technology'... culture is not to be eliminated from the analysis, or from the (theoretical) representation of agriculture. Culture is at the heart of it" (Van der Ploeg 1992: in Portela 1994:270).

To my mind FSR and the 'styles of farming' approach both acknowledge that *culture* is at the heart of *agri-culture*, but the practical problem remains how to achieve coherence and synergy in all its aspects. An example of lack of synergy in rural development is the divergence between the FSR approach and the Structural Adjustment Policy (SAP) approach. While in FSR economic policies are seen as largely given external conditions (exogenous parameters), in the SAP approach the policy environment is seen as the critical variable, the more independent variable (section 5.1:operational problem 1). Moreover, FSR emphasizes the diversity in farming systems in East Africa, while SAP reforms are based on a universal, almost monolithic approach. FSR agronomists working in remote places have little choice but to accept the policy environment as given, although they realize the importance of changes in economic and political factors: a true 'double bind' situation. In the 'hierarchical' order of Diagram 12 economic and political factors carry more weight than technological factors. Unfortunately, however, SAP reforms do not pay attention to the even more crucial categories 4 to1, and therefore probably will not be very effective in improving the well-being of resource-poor farmers.

Box 17: An example of multi-dimensional development: potato production in Uporoto in Tanzania.
The socio-historical construction of potato production in the Uporoto mountains in Tanzania shows that peasant behavior is not only structured by the wider socio-economic context, but is also part of -and contributes to- the dynamics of change of this environment (Andersson 1993)[4]. Peasant behavior is an outcome of *-and shapes-* the wider environment. Peasant actions in Uporoto are not solely determined by external forces such as 'the market' or state interventions -as commoditization theorists tend to believe- nor do they confirm the generality of

2. An obvious reason why the 'human factor' in rural development processes does not receive much attention is that it is an intangible factor. Its elusive character does not permit concrete action by workers in development processes. I will argue that the transcendentalist paradigm not only clarifies the elusive character of the 'human factor' through the concept collective consciousness, but also makes it a factor which (in principle) can be acted upon.

3. Says Van der Ploeg (1994): "I believe it is no shame, but is even necessary, to revitalize classical agronomy in an epoch in which agrarian science is confronted by a crisis that reflects, but also reproduces, the crisis that exists in farming practice".

4. The Uporoto mountains in Tanzania are an area close to Uyole Agricultural Centre, where I worked from 1989-91 (section 4.3).

Hyden's (1980;1983) view on the 'conservative nature' of peasant behavior. In the commoditization model as well as in Hyden's theory peasants are rather passive onlookers (ibid.). In the commoditization model peasants are incorporated in and subsumed to the logic of the market. In Hyden's concept of an 'uncaptured peasantry' - based on an 'economy of affection' with exit-options to safeguard peasants' autonomy- peasant behavior is a barrier to change (section 1.4; footnote 9 in chapter 1; section 4.2.2). In both theories agricultural change is not due to innovative peasants' behavior. The major shortcoming of these political economy approaches is that the active role of peasants in processes of agricultural change is neglected. The state is only *one* social actor in the process of agrarian change. The development of potato production in Uporoto was the outcome of various processes of change: the pattern of urbanization in Tanzania, changing urban consumption patterns, the particular potato trade practice between Uporoto and Dar es Salaam, migration practices resulting in seed introductions, the fall of pyrethrum producer prices, gender relations, and the construction of roads and railways in the 1970s. The potato transport between Uporoto and Dar es Salaam, for example, took place by lorry drivers from Malawi. During the civil war in Mozambique Malawi became more and more dependent on the port of Dar es Salaam. Malawian drivers of empty lorries, on their way to Dar es Salaam, picked up as many potatoes (or other produce) as they could in Uporoto in order to secure some extra income. In this way Uporoto farmers obtained access to the market of Dar es Salaam. The civil war in Mozambique was, to say the least, influenced by the apartheid-regime in South-Africa, which in turn could persist because the international community turned a blind eye on South-Africa's government and its 'destabilization' policy in Mozambique. In this way Uporoto farmers were indeed linked to global politics. This case study shows that peasant behavior is structured by agro-technological, economic, political, socio-structural, cultural and personality factors: the categories 7 to 3 in Diagram 12. Andersson (1993) speaks of a *network of interdependencies*, which stretches out in space and time. This is in line with the framework for multi-dimensional development as depicted in Diagram 12, which includes, however, also a consciousness factor. The term *network* does not imply a kind of hierarchical order.

In an article on the systems dimension in FSR Bawden (1995) remarks:

> "As chaos theory and systemic studies of complexity are revealing, a small change in one system can often result in a very significant (and most surprising) change in other systems far removed from it, in either space or time, and occurring through processes of amplification that probably can never be understood. This has enormous implications with respect to the 'globalisation' of 'local' effects such as pollution, or biocide resistance, or micro-climatic change, or market dynamics".

The *dynamic* and *emergent* nature of interactions taking place among numerous actors and their networks, and between these social actors and nature -including forces which lie beyond the interface situation itself (Scoones & Thompson 1994b)- make that the development process is beyond full human control. In these days of a strong belief in the steering potential of 'the market' some more modesty would be appropriate. Nevertheless, the wish to enlarge our steering capacity remains valid. My line of reasoning runs then as follows: if we do not want to make simplistic judgements based on isolated, narrow-minded disciplinary analyses, but want to take into account the full range of interfaces and interactions among individuals and groups, then we need a new paradigm of development which pays attention to the underlying base of all these interfaces and interactions. In the quest for a new paradigm we need to focus on a leverage point with broad impact. In my opinion the concept collective consciousness offers hope of such a high-leverage intervention with practical relevance. Frontline FSR practitioners require a new conceptual foundation which clarifies constraining and enabling processes. To this end the concept collective consciousness will be discussed in the next section. For those among us who fear that this discussion becomes too theoretical, I would like to recall that there is nothing so practical as a good theory (section 1.5).

9.2 The consciousness factors

The *social structure* of a society can be defined as the pattern or web of social relationships, including economic, political, educational, religious and other institutions or sub-structures (Ransijn 1985a:90). *Culture* is the pattern of norms, values, habits, ideas, goals, etc., that structure social behavior and give meaning to life. Since culture structures social behavior, with a web of social relationships as result, one can speak of a 'socio-cultural structure'. The core of this 'socio-cultural structure' is formed by a set of central ideas and values, that are internalized in the 'collective consciousness' of the members in a given society. Social scientists (Sorokin, Durkheim, Ransijn) say that society is something outside and something inside us. Society has an objective aspect (a concrete social structure) and a subjective aspect (a collective consciousness) (ibid.:91). Ransijn (ibid.:47) defines the *collective consciousness* as "the totality of interacting human minds and the beliefs and sentiments held in common by the majority of a certain collectivity". The collective consciousness and the socio-cultural structure are the inner and outer side of the same socio-cultural reality. The sub-structures in a society are connected through the 'field' of collective consciousness, and therefore all individuals who form these sub-structures are connected. The collective consciousness is the integrating, inner structure of a society, or the 'internalized' society. It is the internalized combination or integration of all sub-structures (section 3.3). Collective consciousness is a crucial factor in social change (ibid.:52). It is the steering factor in the reciprocal interaction between the various categories in Diagram 12. It is virtually impossible to change all the interdependent sub-structures at the same time. An integral or *holistic* structural change implies, however, exactly *that*: a simultaneous change of *all* sub-structures. This is only possible by influencing the very factor that connects all sub-structures and the individuals who form them: i.e., the collective consciousness (ibid.:53). Collective consciousness is an integral, *holistic* factor. It encompasses the categories 8 to 3 and is, therefore, a more independent variable in the interdependent totality of categories. Collective consciousness is the governing variable that integrates a society, it is 'the invisible hand' that 'keeps things together', it has an 'orchestrating' quality. The hypothesis that collective consciousness is a holistic, integrating factor with an 'orchestrating' quality is supported by scientific research on the 'field effect' of consciousness (see section 9.4).

According to Scott & Shore (1979) (quoted in Leeuwis 1993:69,75) sociologists should provide 'simple' explanations that are not just 'intellectually elegant', but explanations that are 'feasible' in that they "reduce a complex question to its simplest forms and identify the minimal, feasible effort necessary to achieve maximally effective change". They must focus on 'robust' theories that include independent variables that are susceptible to control or manipulation. In my view the framework in Diagram 12 with the 'independent' variable collective consciousness is such a simple, elegant and robust theory. Through the 'orchestrating' quality of collective consciousness it is possible to achieve change with a minimal effort. Ransijn (1985a:88) distinguishes two main approaches to improve the well-being in a society: an individualistic approach that emphasizes improvement of individuals (being the building blocks of society), and a socio-structural approach that emphasizes improvement of social structures (which in this case are considered to be dominant over individuals). Other scholars make similar distinctions: Giddens (1984) speaks of interpretative and structuralist approaches in sociology (section 3.3), and Röling (1988) distinguishes between socio-psychological and structural variables (section 3.1). The framework for multi-dimensional development (Diagram 12) allows for integration of the *individualistic-psychological* and *socio-structural* approaches in a single *holistic* approach. The collective consciousness factor integrates the individual and collective approaches (Ransijn 1985a:88). Since the collective consciousness of a society (or any collectivity) is based on the individual consciousness(es) of its members, individuals have a direct impact on the collective consciousness of their group. The 'quality' of the collective consciousness of a group is a direct and sensitive reflection of the 'quality' of consciousness of its individual members (Maharishi Mahesh Yogi: in Ransijn & Schulte 1982:271) (see the next paragraph for a discussion of the concept 'quality' of consciousness). The other way around, the collective consciousness influences the general functioning of the individuals in a collectivity. This dynamic interaction -the principle of reciprocity which connects individual and collective consciousness- plays an important role in the later to be discussed 'field effect' of consciousness. Since in Diagram 12 the collective consciousness factor encompasses the more outer categories, transformation of individual and collective consciousness is an inherently holistic approach. Since the social structure of a society is the outer reflection of collective consciousness, changes in collective consciousness will result in adaptations of this social structure. A reciprocity exists between changes in the quality of social systems and changes in the quality of its individual members. Transformation of consciousness results in changes in structures *from within* (Ransijn 1983b).

The various aspects of the individual performance of people (such as perceptions, attitudes and behaviors) are structured by the connecting field of individual consciousness, since all these aspects are influenced by the style of functioning of the nervous system (Ransijn & Schulte 1982:270). We all know that when we are tired, alert or over-excited, this influences to a large extent our thoughts and actions. Individual consciousness can be described as a totality that arises from the collective activity of the various parts of the nervous system (ibid.). The 'quality' of individual consciousness determines the quality of individual thought and behavior. The quality of individual consciousness is a function of the degree of access to transcendental consciousness, which, in turn, is a function of the condition of the nervous system, of the 'purity' of the nervous system. When the nervous system is free of 'impurities' -when it is not contaminated with 'stresses'- one has free access to transcendental consciousness. 'Tuning in' to the field of transcendental consciousness can be done with the help of, for example, meditation techniques which allow one to transcend the continual 'inner talk', and which release deep-seated stresses. When one tunes in to the field of transcendental consciousness, this consciousness is -so to speak- 'enlivened' in the discursive and practical consciousness: the 'quality' of transcendental consciousness permeates these more 'superficial' levels of consciousness.

An important question is then what exactly the 'quality' of transcendental consciousness is? In the holistic-organismic philosophy of nature (section 7.2) one speaks of a non-material, irreducible, intelligent, organizational pattern that underlies nature (footnote 24 in chapter 8). Maharishi Mahesh Yogi calls this organizational pattern 'the field of creative intelligence', a field that underlies all nature, including people. People have access to this field through their own consciousness: when they experience the field of transcendental consciousness they are at home in the field of creative intelligence. The field of transcendental consciousness and the field of creative intelligence are identical, this field is the source of 'subjective' as well as 'objective' existence[5]. In the Diagrams 11 (section 8.4) and 12 (section 9.1) this field is referred to as the paradoxical spirit/Spirit. The field of creative intelligence is simultaneously transcendent to -and immanent in- the world. In the course of human history this field has been given numerous names: in theistic traditions one refers to God(s), while in nontheistic traditions one postulates, for example, a nonlocal 'Tao'. In the Indian Veda tradition the paradoxical spirit/Spirit is referred to as 'Atman/Brahman'. In the philosophy of Maharishi Mahesh Yogi (1995:329) the field of creative intelligence is a field of infinite organizing power, characterized by a quality of *silent dynamism.* In the silence of transcendental consciousness all possibilities are in potential available, they exist in unmanifest form. This field is the basis of all creation and evolution. With regard to the concept 'field' Chopra (1991:209/210) says:

> "Over the last fifty years, the concept of the field rose to prominence in physics when it was realized that matter and energy have no fixed, concrete existence. .. ..the basic tenet of quantum reality, the famous Uncertainty Principle, which says that elementary particles, although they appear to exist in a definite place in time and space, cannot actually be found there. .. Instead of having a solid particle to hold on to, they [the physicists] were left with a set of possibilities, and if all the possibilities were lumped together, the result was a field. .. ..the word 'field'.. ..[conveys] a sense of nature's wholeness. A field is the most complete way to describe anything, from an atom to a star, because *all* possible descriptions are embedded in it".

In section 8.1 (Diagram 10) I have argued that the process of thinking starts from the level of transcendental consciousness. Through a process of transcending one can reach this 'source of thought'. *A crucial hypothesis* in this study is that thoughts which are experienced in their very early stages are spontaneously 'life-supporting' or 'evolutionary'. 'Life-supporting' or 'evolutionary' means in this context that behavior which is, partly, based on such thoughts stands a greater chance of being *societally and environmentally friendly* (section 3.3). Such very subtle thoughts result in internal norms and values (basic attitudes) that 'guide' behavior in a societally and environmentally friendly direction. I used the word 'partly' because behavior is also based on the discursive and practical consciousness (the arrows 1 and 2 following the upper route in Diagram 5). Some authors argue that behavior (acting) is not (only) grounded in discursive thinking (Bos 1974; Gremmen 1993; Spaargaren 1997; Clark 1997), but can also emerge from a 'practical consciousness' (section 3.2). This 'practical consciousness' is located in between the transcendental and discursive consciousness (Diagram 5 in chapter 3). It represents a level of thinking which is more subtle than

5. It seems as if quite some physicists tend to a similar conclusion. Oates (1990), among others, presents an overview of the latest developments in quantum physics to illustrate this point. He refers to the following physicists: E.C.G. Sudarshan, Sir Arthur Eddington, Werner Heisenberg, Fritjof Capra, Albert Einstein, Heinz Pagels, Daniel Freedman, Peter van Nieuwenhuizen, Max Planck, and John Hagelin. Although physicists have not completely fulfilled their quest for a unified understanding of nature, they have at least glimpsed the possibility of a basic unified field in their latest unified field theories. However, the difficulty with this field of infinite potentiality is that the most basic level of nature is "untouchable through material means. .. ..it is technically not possible even to *think* about the unified field in any reasonable way. ... Thus, the unified field of natural law has its existence where not only space and time have come to an end, but where even the logical, cause-and-effect structure of thinking cannot make an entrance. The unified field, with its promise of infinite possibilities, seems frustratingly out of reach" (Oates 1990:118). Fortunately, the unified field is not only a physicists' concept, but also a reality which can be directly experienced in one's own consciousness. See also section 8.3 in which the 'physics-supports-mysticism' idea is thoroughly scrutinized. And footnote 24 in chapter 8 about *stones* and *Stones* which can be distinguished but not separated.

the thinking at the level of the discursive consciousness, but it is not the very refined 'thinking' at the interface of the practical and transcendental consciousness. Although Diagram 10 is based on the analogy of a bubble rising in a pond, and should therefore not be taken too literally, it is, to my mind, a very instructive 'model' (section 8.1). A model, moreover, that fits in with my meditation experiences. Very subtle thoughts are 'life-supporting' in the sense that they are not yet 'contaminated' by interference of the ego-personality. If one can only experience thoughts at the gross conscious level of thinking, they will always be subject to emotional and other limitations of the ego-personality (section 8.2). According to Maharishi Mahesh Yogi *knowledge and reality are structured in consciousness*: in different states of consciousness people have access to different 'qualities' of knowledge and reality. An 'enlightened' person maintains the state of transcendental consciousness permanently, i.e., simultaneously with the 'normal' states of waking, sleeping and dreaming consciousness (the transcendental consciousness is permanently 'enlivened' in the other states of consciousness). Since transcendental consciousness is 'consciousness-as-such' without any content, how can one be aware of it then? To hold onto the transcendent while being aware of it, and while thinking thoughts, sounds like a complete contradiction, *and it is*. "The transcendent by definition is silent and void of thoughts" (Chopra 1991:237). Nevertheless, experience shows that persons can entertain two states of awareness at the same time: everyday awareness can be blended with transcendent awareness (ibid.). Such paradoxical states can only be 'lived', i.e., directly experienced. The proof of the pudding is in the eating.

The hypothesis that very refined thoughts -which emerge from the field of transcendental consciousness- guide attitudes and behavior in a societally and environmentally friendly direction is based on the following considerations. *First*, the existence of a universal, trans-personal level of consciousness can be deduced through logical thinking (see section 8.1). *Second*, throughout the history of mankind people (including contemporary scholars, e.g., Tarnas 1993 and Duintjer 1996) have referred to a creative source of all cultures and traditions, a kind of trans-historical Archimedean point. *Third*, the assumption underlying the attempts of people to get access to this field of transcendental consciousness has been, and still is, that such access results in more happiness and more societally friendly behavior. Also today many scholars believe that spirituality facilitates societally and environmentally friendly behavior (a.o., Schumacher 1977; Ransijn & Schulte 1982; Wilber 1985; Vink 1987; Dossey 1989; Russell 1990; Kockelkoren 1992; Duintjer 1996; Zweers 1996; Weeda 1996; Huizer 1998; Patel 1998). *Fourth*, institutionalized religions have attempted to provide guidance on how to gain regular access to the field of transcendental consciousness, but, by and large, have not been very successful in doing so - taking into account the lack of societally and environmentally friendly behavior with a large part of the world population. Instead of providing effective techniques that result in experiential spirituality, the emphasis has been on rational morality based on authority (section 8.2) (minority groups within the institutionalized religions, however, have stressed the importance of individual mystical experiences). *Fifth*, although *direct experience* of the field of transcendental consciousness can only be gained subjectively, we have seen in section 8.4 that verification of such experiences is possible in communities of trans-subjective 'peers'. *Sixth*, research shows that the *effects* of these experiences can be registered and measured with scientific instrumentarium. Scientific research on, for example, the TM technique indicates that the state of transcendental consciousness is a measurable reality: our neurophysiological system produces *effects* that can be 'objectively' verified. This implies that a person's progress in the development of consciousness can be measured in an ‘objective’ manner with the help of physiological and psychological data, and the effectiveness of techniques used can thus also be determined (Schulte 1984c:239)[6] (I will come back to the scientific research on TM). *Seventh*, scientific research on the individual and collective effects of the TM technique suggests that regular practice of this technique -presumably providing access to transcendental consciousness- results in societally friendly behavior (see section 9.4)[7].

Individuals enjoy a ‘high quality’ level of consciousness when they have free access to the field of transcendental consciousness, when this field is ‘enlivened’ in their practical and discursive consciousness. The organizing power or ‘orchestrating’ quality of this field results in a coherently functioning neurophysiological system, which, in turn, *facilitates* the cultivation of societally and environmentally friendly behavior. Similarly, a social holon enjoys a ‘high quality’ collective consciousness when this consciousness is *coherent and enlivened by transcendental consciousness* through the access of its members to the field of transcendental consciousness. In this context it is important to remark that social holons with a coherent collective consciousness that is not enlivened by transcendental consciousness, are threatening and not societally friendly (the friendliness is restricted to the own group). Such a superficial ‘low quality’ -albeit coherent- collective consciousness does not result in a comprehensive societal rationality (or wisdom: section

6. I put ‘objectively’ and ‘objective’ in quotation marks because truly ‘objective’ research does not exist, also not in the positivist paradigm.

7. Given the relationship between psychological health and the practice of the TM and TM-Sidhi program (the latter is an advanced meditation technique), the issue of causality and directionality must be addressed (Gelderloos 1987:222-23). Gelderloos (ibid.:221) concludes in his Ph.D. study that “advanced participants of the TM and TM-Sidhi program tended to score higher on several indicators of psychological health....than advanced TM participants, who in turn tended to improve significantly after having been instructed in the TM-Sidhi program. The Non-TM group scored relatively lowest on the various measures, and improved relatively least over a time period of nine months on several of the measures. In addition, advanced participants of the TM-Sidhi program who displayed during the practice of the TM-technique certain physiological characteristics that are presumably indicative of experiences of transcendental consciousness tended to score higher on several psychological health measures than comparable subjects without those physiological indicators”. He continues (ibid.:226): “assuming that the TM and TM-Sidhi program could have major impacts on personal development, what is it in these programs that is responsible for these changes? Is it the effect of the various techniques in terms of transcending, is it the holistic effect of all diverse elements together, or is it rather a function of belief in their effectiveness, or is it just the specific daily routine? The outcomes....suggest that experiences of transcendental consciousness, if they are truly reflected by the employed physiological indicators, could possibly play some role in the differential development of psychological health, although this study did not rule out the possibility of a reverse relationship - better psychological health allowing more experiences of transcending, or the influence of a third variable, for instance, optimal physical health, which could be the basis of psychological health and profundity of meditation experiences. It would be very interesting to investigate further the details of these relationships in more experimental settings, with longitudinal designs”. Gelderloos (ibid.:229), finally, says: “The nature of the reported relationships [between transcendental experiences and psychological health], in terms of causality, cannot be assessed in experimental ways, since the experiences that make up the independent variable usually only occur in a random way. ... With the TM and TM-Sidhi program the experiences of transcending could be manipulated, at least to some extent, and the impact of such experiences could be studied in a more experimental fashion. ... With a basic state of consciousness in its pure form that apparently has an acceptable degree of intersubjective reliability, and that could be manipulated through techniques like the TM and TM-Sidhi program, psychology could possibly start to fulfill its original pursuit, the scientific study of consciousness”. Moreover, the TM technique is grounded in an internally consistent theoretical framework - the transcendentalist paradigm.

8.3). True societal rationality must entail a convergence of individual and public interests at global scale. Koestler (1989:243) differentiates between *identification* (regression) and *integration* (progression). Identification with tribe, caste, nation, church or party is regression to an infantile form of self-transcendence, it is crowd mentality. Holocausts are derived from primitive *identification* instead of mature social *integration* (see also footnotes 10 in chapter 7, and 13 in chapter 8). Only integration -in which self-assertive and self-transcending tendencies are simultaneously realized- can result in societally and environmentally friendly behavior. This simultaneous realization of two opposing tendencies demands access to the field of transcendental consciousness (see section 11.1).

In the preceding paragraph I remarked that a 'high quality' individual consciousness *facilitates* the cultivation of societally and environmentally friendly behavior. I used the word 'facilitate' in order to indicate that techniques for consciousness development are only one -although in my eyes an important and hitherto neglected- possibility to achieve societally and environmentally friendly behavior. People can learn to manage, for example, common property resources, simply because they -at last- recognize that they are interconnected: they realize that collective agency and concerted action are the only way to solve their common problem (Box 15 in chapter 6). In such a case collaboration implies choosing the lesser of two evils. This refers to an *aposteriori*-willingness to act, or reactive change, to the upper route in Diagram 5 (section 3.3). I believe that both negotiated agreement (rational morality) and experiential spirituality play a role in the development of a sustainable society (section 8.2). To my mind it is prudent to bet on both horses, on both routes in Diagram 5. Access to transcendental consciousness does not automatically result in effective action in the domain of existence. Relevant knowledge and practical skills -learned, constructed and evaluated in the upper route- are also necessary. An enlightened spiritual teacher is not necessarily a good scientist or a competent farmer. *Experiential spirituality, however, can guide the application of knowledge and skills in a societally and environmentally friendly direction.*

In modern society the gap between cerebral-intellectual development and emotional-moral-spiritual development results in technology development that seems to get out of control (Ransijn & Schulte 1982:343)[8]. The problem, however, does not seem to be located in our technology, but in ourselves. There is not an excess of technology, but a lack of consciousness: "this guiding factor leaves much to be desired" (Ransijn 1985a:49). The root of the problem seems to be located in human inability (ibid.:63)[9]. The need for improvement of human capability surfaced also frequently in this study (sections 5.1; 5.2; 6.1; 6.2; 8.2). When we make decisions, we often simply act as we *feel* is best (this might refer to the arrows 2 and/or 3 in Diagram 5). As we raise our level of

8. Ransijn (1985a:55) remarks: "Our passions, instincts and fears, like unbridled horses, pull a heavy cart full of the produce of technology, but the waggoner has let the reins slip from his hands and is sunk in 'the dream of reason' ".

9. Hermann Hesse (1974:77) wrote in 1919: "If we wish once again to have minds and men capable of securing our future, we must not begin at the tail end, with political methods and forms of government, but at the beginning, with the building of the personality". Or, in other words: if you want to reform the world, start with yourself. Beets (1990:295) says that socio-cultural dimensions of development are often more important than technical issues, but project interventions that are to change these socio-cultural conditions are not formulated. Although such interventions should form the core of projects, they are hitherto *attached* to projects as *after-thoughts*. He refers to the process of changing socio-cultural conditions as *social engineering* (ibid.:338).

consciousness, the way we feel will spontaneously change. One refrains from 'wrong' action, simply because it *feels* wrong (Russell 1990:121)[10].

The framework for multi-dimensional development (Diagram 12) and the theory of consciousness as expounded in this section suggest that the underlying cause of conflicts in interests between individuals and collectivities is a 'low quality' collective consciousness. A 'higher quality' collective consciousness of the actors involved supposedly facilitates the reconciliation of diverging interests, it results in 'mature social integration' (to use Koestler's term). A 'high quality' collective consciousness facilitates the integration of the various categories of factors, it facilitates a holistic approach to problem solving.

Box 18: The need for multi-dimensional development: irrigation schemes in Africa.
The introduction of irrigation schemes in existing farming systems is a striking example of undue emphasis on only one component of complex farming systems. Apparently, the lure of irrigated farming is difficult to resist considering the incessant call for more irrigation facilities by politicians and agricultural experts (it is 'modern' and high-external-input oriented). If, for example, in Zimbabwe all possible water resources would be developed, 1 percent of the nation's land might be irrigated. If all reasonable agricultural soils would be developed for dryland cropping, another 10 percent would be added to the cultivated area. The condition of watersheds in the 90 percent non-cultivated land, on which everything depends, does not receive attention however (Savory 1991:16). My experience in the Lower Tana delta in Kenya (section 4.2) is not an isolated case. Similar stories can be told, for example, about the Senegal river in West Africa (Huibers & van Wetten 1993). Diemer (1990) speaks of irrigation as a socio-cultural phenomenon: the introduction of Western irrigation technology -based on an 'engineering paradigm'- in Africa is not a culturally neutral activity. He uses Bourdieu's concepts 'habitus' and 'dispositions' to clarify this. An individual's *habitus* is a "system of durable, transposable dispositions" (transposable in the sense of applicable in other situations), and *dispositions* are internalizations of the objective circumstances in which actors grow up and live (ibid.:230,8). Acting is subsequently an externalization of the dispositions in a particular situation. Dispositions are thus a kind of internalized norms that result in repeated behaviors; all of an actor's previous experiences are stored in such dispositions. The set of dispositions functions as a matrix with which actors perceive and evaluate situations, and act (ibid.:8). In the terminology of my framework (Diagram 12) an individual's habitus or 'set of dispositions' is the individual consciousness in which norms and values are internalized, while the 'set of habituses' of a group is the collective group consciousness. Says Diemer: "The habitus is the source of series of moves that are organised as strategies without being the product of a strategic intention. Each group (or person) willy-nilly, is a producer and reproducer of meaning, although possessing an only fragmented consciousness of the dispositions that govern its (or his) behavior". The dispositions are "collectively orchestrated without being the product of the orchestrating action of a conductor" (ibid.:230). The habitus is people's second nature. Bourdieu says that the history of people is hidden in the unconscious (ibid.:9). To my mind this sounds all a bit vague. If dispositions are collectively orchestrated, *who* or *what* orchestrates then? Above remarks indicate that individual and collective consciousness possess a certain degree of 'independence'. They function as autonomous entities resulting in a kind of 'automatic' behavior, but how all this comes about remains unclear. In my framework the collective consciousness is a more independent variable in the interdependent totality of categories, a variable with an 'orchestrating' quality. The notion that a habitus is people's second nature comes close to the concept 'practical consciousness' as used by Spaargaren (1997) (sections 3.2 & 3.3 and Diagrams 5 & 7). According to Diemer (ibid.:239, note 19) the emergence of regularities in social life is a central problem in contemporary anthropology, but the analysis of the relations between structure on the one hand and the acting of individuals and groups on the other, still lacks a theoretical paradigm. As we will see later on, the collective consciousness

10. Russell (1990:121) says in this context: "We might think of this as the growth of intuition - and in the final analysis it is intuition which is at the basis of all our moral laws however they may subsequently be rationalized and codified". One's intuitive responses, however, must "still be analysed in the cold light of day and here the synthesis of intuition and reason ... becomes of increasing importance". We will come back to the synthesis of intuition and reason in chapter 12.

factor clarifies the relation between structures and actors. The agro-technical factors in a farming system, the local economic, political, socio-structural and cultural factors, and personality factors influence the dispositions of farmers. Western trained (expatriate and local) engineers have a different set of dispositions. A cultural gulf separates engineers from farmers, because engineers wish to externalize dispositions that do not match with the ones of resource-poor farmers. For resource-poor farmers irrigated production is always *part* of a farming system, rather than a system in itself. This contrasts with the engineering paradigm as expressed in large-scale (and often also small-scale) irrigation schemes. Communication breakdowns result in serious conflicts between farmers and scientists (Scheer 1996) (section 4.2). Irrigation designs must match the economic, political and organizational dispositions of farmers. Irrigation development unavoidably involves a negotiating process between engineers and planners on the one hand, and (male and female) farmers on the other. Design criteria for the canal network and plot characteristics must be topic of discussion in an open process of negotiation (Diemer 1990:232). Diemer asserts that his analysis of the irrigation crisis in Africa has only analytical value when one does not develop a remedy. Researchers should get to work with the outcome of their analyses: they must promote *a change in mentality* with the actors involved (ibid.:viii). Although Diemer mentions the categories 8 to 3 in Diagram 12 as being relevant to the study and design of irrigation facilities (and in this he is a favorable exception!), he does not refer to the consciousness factor. Nevertheless, he comes close to the concept collective consciousness in his use of the terminology of Bourdieu.

Above case of irrigation development in Africa shows that the development and exploitation of irrigation facilities is subject to continuous -whether hidden or not- struggle (see also section 4.2.4). Some African government officials see in the industrial and authoritarian ‘engineering paradigm’ a means to accelerate the historical process of subjection of farmer societies to the authority of governments. Frequently, however, governments have less control over water distribution and input of farmers’ labor than civil servants assume or wish (Diemer 1990:219) (see also my predisposition number 3 in section 1.4). The ensuing process of negotiating and bargaining plays an important role in virtually all development programs, but it is not always made explicit. The explicitation of this process is important because it can clarify why so many development programs take long before achieving concrete results, or fail altogether. Struggle and hidden agendas suggest, in my view, the existence of an incoherent, low quality collective consciousness[11].

9.3 The actor-structure debate re-visited

In the actor-structure debate in the sociology of rural development the interaction between actors and structures is central, but their precise relationship remains unclear (Leeuwis 1993:83) (sections 3.3 & 3.4). In the Diagrams 5 and 8 (chapter 3) this interplay between actors and structures is depicted, but it needs to be pursued in more depth in order to be able to effectively influence behaviors[12]. It appears that a fundamental (meta-)theory is needed “of what exactly social

11. Leeuwis (1993:90) says: “The actor approach provides a better language for dealing with struggles and conflicts that emerge at particular social interfaces, than with the cooperation, accommodation, and collective agency which is also implicit to such interface situations. Clearly, the understanding of these latter phenomena too is crucial for achieving non-accidental social change”. While critical systems thinking and the actor approach focus more on the aspects of incoherence, soft systems thinking emphasizes the aspects of coherence in the collective consciousness.

12. One can describe the actor-structure interaction in terms of Maturana & Varela’s (1987) autopoiesis theory. A ‘structural coupling’ between actors and structures makes behavior of actors *determined* as well as *free*. The

structures are, how they influence social (inter)action and vice versa" (ibid.:39). Such a meta-theory must allow for an *active* conceptualization of human action (ibid.:42)[13]. Long & Van der Ploeg characterize 'structure' as an *'extremely fluid set of emergent properties'* in which a dynamic balance of interlocking and distantiation of actors' projects emerges (section 3.4). One can argue then that the world is one big set of interlocking projects, but to say that 'everything is connected with everything' is not very enlightening (Leeuwis 1993:82). On the basis of my framework for multi-dimensional development (Diagram 12) I argue that the statement 'everything is connected with everything' is not very helpful as long as the 'how' of the interlocking is not understood. When, however, the collective consciousness factor would act as a 'field' which connects the multitude of actors' projects, then the mechanism of interaction becomes more clear. And even more important: practical methods to influence these complex interactions might become available.

In section 3.4 we have seen that different actors create different spaces for manoeuvre: the same external structures are experienced as constraining or enabling. In my view the space for manoeuvre depends on the ability of actors to 'tune in' to the collective consciousness. When, for example, an actor like Hitler tuned in to the collective consciousness of the Germans -which at that point in time was poisoned with frustration- he gained wide support (Fromm 1941) (see also footnote 10:chapter 1). Hitler as a single individual could never have achieved such a power base if the majority of the population would not have allowed him to do so. To put all responsibility for the emergence of Nazism on the shoulders of one individual, does not make sense. Hitler, apparently, was very capable in 'tuning in' to the collective consciousness, and thus able to create large space for manoeuvre. When the German collective consciousness would have been less 'superficial' -i.e., when enough individuals would have got regular access to transcendental consciousness- then individual and group behavior would have been more societally friendly. Hitler's attempts to appeal to infantile forms of self-transcendence -resulting in self-destructive, sacrificial behavior- would have fallen on deaf ears, in spite of his verbal overkill (section 9.2)[14]. In this context I want to quote Latour (1986) (in:Leeuwis 1993:107) who states that:

> "power is not something one can possess - indeed it must be treated as a consequence rather than as a cause of action. ..the notion of power may be used as a convenient way to *summarise* the consequence of a collective action, it cannot also *explain* what holds the collective action in place. ..society is not what holds us together, it is what is held together. Social scientists have mistaken the effect for the cause, the passive for the active, what is glued for the glue. Appealing to a reserve of energy, be it 'capital' or 'power', to explain the obedient behavior of the multitudes, is thus meaningless. This

flexibility of the structural coupling of autonomous actors creates space for manoeuvre (footnote 3 in chapter 6; footnotes 3 to 7 in chapter 7). Here also *paradox* seems to abound.

13. Leeuwis (1993:42) says that soft and critical systems thinkers suggest that "organizations can realistically become integrated wholes with a fairly unambiguous mission, if only those that manage them adopt certain methodologies and/or provide conditions for undistorted communication. That is, there still seems to be an underlying assumption that human behavior can be determined by means of externally provided structures, i.e., methodologies and conditions. This means that it is doubtful if this framework allows for an *active* conceptualization of human action". In my view the task to become integrated wholes is mainly a task of the individuals who constitute these wholes. Individuals can directly contribute to a 'high quality' collective consciousness, and are thus *actively* involved. The *action*, however, takes place at a non-discursive, 'deeper' level of consciousness.

14. Another example of successful 'tuning in' is the appeal to the 'lowest common denominator' in many television programs. If you are good in 'tuning in', you can reach a lot of people.

reservoir is full only as long as you do not need it, that is as long as others dutifully fill it. It is empty when you need it, that is when the others are no longer filling it. There is no way out of this paradox. No matter how much power one appears to accumulate, it is always necessary to obtain it from the others who are doing the action..".

Another example to which Latour's interpretation of the concept 'power' applies, is the fall of the Berlin wall (see also footnote 6 in chapter 3). As soon as a certain number of actors start to interpret 'power' in a different way - i.e., power to the people- governments become powerless. The cause, the active, the glue, what holds us together, is -in my view- the collective consciousness. The effect, the passive, what is glued, what is held together, is society[15]. With regard to the issue of power in the Dutch pig farming network, Termeer (1993) concluded in a study on the dynamism and inertia around Dutch manure policy that the pig farmers, the government and the environmental movement have power insofar and as long as outsiders assign power to them.

Instead of characterizing structure (the 'outer' side of a socio-cultural reality) as an *extremely fluid set of emergent properties,* I would rather apply this characterization to the fields of transcendental and collective consciousness. The field of transcendental consciousness has been characterized as a field of all (as yet unmanifested) possibilities (section 9.2). Since 'hard' structures are the embodiment of collective consciousness, they must also be to a certain extent 'fluid'[16]. Nevertheless, experience teaches that structures are not easy to change (see my work experiences in chapter 4, and the review of FSR literature in chapter 5). The underlying reason might be that methods to influence the collective consciousness have not been available. One of the main issues selected in chapter 5 was the lack of countervailing power with resource-poor farmers. Rural development is the result of a dynamic balance of intervention power of change agents and countervailing power of farmers (section 3.1). Strong and democratic farmer organizations are necessary, but how does one achieve a dynamic equilibrium of self-assertive and integrative tendencies, of independent *actors* and strong *structures*. Synergy supposedly emerges with a balance in power between farmer organizations and organizations of change agents. Since 'power', however, is a consequence rather than a cause of collective action, it seems to me that we must move out of the sphere of 'power', and start looking for the cause of collective action - i.e., the collective consciousness. Critical systems *thinking* (focusing on analyses of power configurations) and soft systems *thinking* (focusing on collective agency) are enacted at the level of the discursive consciousness, the emphasis is on arrow number 1 in Diagram 5. Ideally the development of sustainable farming systems should be actor-driven *and* system-driven. The interplay between actors

15. Chopra (1991:232) says: "Whenever a flow of consciousness moves up from the depths of the human spirit, great transformations can occur with dramatic speed. Tearing down the Berlin wall signaled a new rise of freedom that was taking place among nations. But what is a nation except a collection of individuals? Politics is what happens 'out there' in response to shifting mental events 'in here'. The Berlin wall first had to come down inside people's awareness before it could come down physically. We do not think of political change in this way mainly because people are not generally united in their inner perspective. Sometimes, however, a surge of consciousness carries everyone along". In the terminology of the transcendentalist paradigm one would say that governments (or any other authorities) are a reflection, an innocent mirror of the collective consciousness. Savory (1991:505/506) remarks that governments do not lead but follow, and that, as people change, governments and institutions will change. Goverde (1995:37) says that politics, in the final analysis, is work of people. See also Röling (1968:68).

16. In the terminology of Maturana & Varela one can say that the field of collective consciousness is the abstract, web-like organizational pattern that finds expression in specific 'hard' structures.

and structures, however, takes place in the field of collective consciousness. I argue that a ‘high quality’ collective consciousness facilitates the integration of personal and public interests. Lower-level holons (individual actors) and higher-level holons (structures) function optimally through the ‘orchestrating’ quality of the underlying field of transcendental consciousness. Chambers (1997:220) distinguishes three interrelated dimensions of change: *institutional change* referring to sharing and partnership between institutions, *professional change* referring to methods, and *personal change* referring to behavior and attitudes. In his view personal change has primacy, behavior and attitudes are the key (ibid.:210, 215) (see also section 3.1)[17]. In the Diagrams 5 and 12 the collective consciousness factor is a central concept that can help to problematize, and finally transcend, the actor-structure dualism (and the related voluntarism-determinism dualism) (section 3.1). The importance of a ‘high quality’ collective consciousness as an integrating, holistic factor would be difficult to overestimate when the theory of the fields of transcendental and collective consciousness proves to be correct. Research findings that support this theory are presented in the next section.

9.4 The field effect of consciousness

Since 1972 I practise the Transcendental Meditation (TM) technique. The discussion in this section focuses on the effects of this particular meditation technique, because it is the only technique which I personally have practised for a long period of time, and because it is a meditation technique which has been subjected to prolonged and thorough scientific research. I do not claim that access

17. Chambers (1997:208) says: “..behavior and attitudes, what sort of people we are, how we relate to one another are so universally significant that their neglect [in the literature of development] is bizarre. ... The personal dimension is a bizarre blind spot in development (ibid.:231). ... Given this primacy of the personal, psychological studies of ‘uppers’ have been oddly absent from development studies. ... Perhaps the most neglected aspect of development is the personal psychology of what powerful professionals believe and do. ... Personal change is a minefield, the subject of much evangelism, mythology, popular writing, and psychological and managerial lore. It is value-laden” (ibid.:232). Chambers (ibid.:188,209) argues that it is especially the ‘uppers’ who have to change. The three interlinked changes are radical “for they are not just to put the last first, which is altruism; they are to put the first last, which is disempowerment” (ibid.:211). Such ‘reversals’ would be absurd if pushed to anarchy, some hierarchy must be retained “while loosening constraints and freeing actors” (ibid.). Here the difficult search for a delicate balance surfaces again. When power is not seen as a commodity, selfish behavior -based on a zero-sum orientation where one’s gain is another’s loss- can transform into altruistic or generous behavior - based on a positive-sum orientation in which all gain (ibid.:234). Uppers need to disempower themselves, and empower lowers. Disempowerment is often a positive sum. Unfortunately, “the fear of freedom afflicts not only fascists. It can also daunt those whose dominance is grounded in denials of democratic diversity. Many professionals need the solid structures of their realities, their prisons” (ibid.:235). I would say that most professionals are imprisoned in the identification with the rational-empirical consciousness, and thus deny the existence of a diversity of modes of being. Instead of speaking of (dis)empowerment of certain groups, I would rather focus on the collective consciousness factor. When only ‘uppers’ change, there is no guarantee that ‘lowers’ will change (if only for the fact that the number of professionals will never match the number of farmers). Chambers’ (compassionate and sympathetic) line of reasoning seems to be based on the assumption that a relatively small group of powerful professionals can frustrate development. I do not believe that a small minority of people can have such an impact (unless they all would be ‘enlightened’ individuals with a strong ‘field effect’ on the rest of society; in that case, however, the effect could only be positive: see the next section). To my mind the quality of the collective consciousness of the actors in the rural development process is not ‘high’ enough to foster development. All actors can do their share to enhance the quality of the collective consciousness.

to the field of transcendental consciousness cannot be achieved through other means than meditation techniques, nor that TM would be the only suitable meditation technique. Rather I would say, that I cannot do otherwise than focus on a technique with which I have first-hand experience, and which provides ample opportunity for a scientific debate.

According to Maharishi Mahesh Yogi (1969:78) the basic idea underlying TM is simple:

> "Problems are not solved on the level of problems. Analysing a problem to find its solution is like trying to restore freshness to a leaf by treating the leaf itself, whereas the solution lies in watering the root".

or, in the words of Swanson & Oates (1989:102):

> "If you water the root of a tree, every branch and leaf and fruit gains nourishment. If you improve the human neurophysiology, every feeling, thought, and action becomes healthier, stronger, and more effective".

When the neurophysiological system constitutes the basis of human behavior, and the TM technique works from a deep level of the human physiology, then holistic performance could become a realistic option. Environmentally and societally friendly behavior could be facilitated through techniques for consciousness development. Say Swanson & Oates (ibid.:90): "the nervous system generates an improved quality of consciousness automatically when its internal operation becomes more orderly and balanced". A more orderly and balanced neurophysiological system, a coherent nervous system, should be reflected in coherent brain waves. Brain wave research -based on electro-encephalograph (EEG) patterns- indicates in meditators a diametrical combination of both rest and wakefulness (ibid.:66). As we have seen earlier on, these are the characteristics of the state of transcendental consciousness (section 8.1). The state of transcendental consciousness, presumably, provides a unique EEG 'signature', which does not emerge in the states of waking, dreaming and sleeping consciousness. Research on meditators shows an inter-hemispheric brain wave coherence: the left hemisphere (specialized in detailed work and linear processing) and the right hemisphere (specialized in big picture synthesis and simultaneous processing) are intimately collaborating. Such an integrated brain can combine linear, analytical thinking, and synthetic, synchronous thinking (ibid.:51). This is the basis for multi-variate growth - for diametrical development resulting in both intelligence and creativity, both stability and adaptability, both self-esteem and teamwork (we will return to this growth of opposing qualities in chapter 11). The basis of holistic development could therefore reside in our neurophysiologies[18]. Swanson & Oates (ibid.:160) say that also human morality is firmly

18. In their book on 'enlightened management' Swanson & Oates (1989:5) say: "Most management theories and programs are like computer software. They just give instructions to the *human computer*. They tell your people what to do. But getting dramatic improvements in human output is like getting dramatic improvements in computer output: you have to upgrade the hardware. The most precious resource of your business is the brain physiology of your people - the neural hardware of your human computers. Now hundreds of published scientific papers and numerous case studies have shown you can upgrade this most basic level of business success -the nervous systems and brains of the people you employ- through the implementation of an innovative but much-researched self-development technique, the Transcendental Meditation program founded by Maharishi Mahesh Yogi. ... There is already more research documenting [the] benefits than there is for any other management program. And best of all, the outcome is strictly win-win: employees enjoy their personal growth as much as management appreciates the increased profits". In spite of the positivist-oriented use of language -"building high-performance people" really sounds like 'social engineering'- the message of the book -

rooted in physiological functioning: “when the nervous system works more coherently, character improves”.

> “One type of evidence comes from standard psychological tests, which have repeatedly shown that TM reduces irritability, aggression, and hostility. When stress decreases, people begin to feel better. They experience fewer of the negative emotions that lead to anti-social behavior. Their moral behavior should improve, and psychological testing shows this is true” (ibid.:160,161).

When TM was taught to ‘maximum security’ prisoners even these hardened criminals, after two to three years practice of TM, improved dramatically on personal maturity and character development (Alexander 1982). Apparently, a broadened awareness produces thoughts and actions which are not only useful to oneself, but also to others.

Box 19: Scientific research on TM

It might be useful to indicate here that research on the effects of TM has not only been implemented by TM-affiliated organizations or institutions. Alexander (1982), mentioned here above, presented his research findings in a Ph.D. thesis at Harvard University, Cambridge (MA). The first research on the physiological effects of TM - by Wallace (1970)- was published as a Ph.D. thesis at the University of California. In The Netherlands Gelderloos (1987) presented his research findings on the psychological health of meditators in a Ph.D. thesis at the ‘Katholieke Universiteit’ Nijmegen. Ransijn (1984) finalized his sociological study on collective consciousness and peace with a Ph.D. thesis at the University of Rajasthan, Jaipur, India. The philosopher Schulte (1984c) presented his investigation into the experiential basis of Schelling’s philosophy of consciousness, and the relation between Schelling’s philosophy and the TM philosophy, as a Ph.D. thesis at the University of Amsterdam. Other examples of doctoral dissertations on TM are: Shapiro 1974; Nidich 1975; Bosmajian 1977; Bauhofer 1978; Ferguson 1981 and Davies 1988. These are only some of the scientific publications on TM. In 1991 about 430 studies had been conducted at 160 universities and research institutions in 27 countries (MIU 1991). All research papers on the physiological, psychological and sociological effects of the TM technique and the TM-Sidhi program (an advanced meditation technique) have been collected in six volumes (*Scientific Research on the Transcendental Meditation and TM-Sidhi Program: Collected Papers Volumes 1-6.* Maharishi Vedic University Press, Vlodrop, The Netherlands, 1976 to 1995). Many of these papers have been published in scientific journals. Fagan (1995:67) -a molecular biologist with a Ph.D. from Cornell University- reports that in 1995 over 500 research studies on the effects of TM-related programs on health had been published by scientists from over 200 different research institutions around the world (for details I refer to above mentioned *Collected Papers*). All this supports my statement that TM is a thoroughly investigated meditation technique.

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upgrading of the quality of human resources is possible- is too important to be neglected.

Van Heijst (1996) argues that *science* aims at control through thinking, *magic* or magical practices aim at control through acting, and *spirituality* aims at ‘tuning in’ and ‘receptivity’. In spirituality an *open-minded* mode of being entails the *dis-covering* of an eternal and universal (always already present) field of transcendental consciousness. I agree with Van Heijst that in many popular books on spirituality the quality of ‘receptivity’ tends to be overlooked. In *active* pursuit of higher levels of consciousness, success on the spiritual path of development seems to be *guaranteed*. Such a spirituality is the aftermath of the identification with the rational-empirical consciousness, in which *control* through thinking and acting is central. The word ‘receptivity’ appears in the definition of spirituality as given in this study (section 8.1). Also the TM movement tends sometimes to a somehow ‘mechanistic’ view of consciousness development. When I started practising the TM technique in 1972, the impression created by the TM movement was that about 10 years of regular meditating (twice a day) would result in ‘enlightenment’. *No way!* - at least with me. Nevertheless, I am so satisfied with the effects of this simple technique that I am still practising it after 25 years. The singer Paul Simon says: “But I would not be convicted by a jury of my peers. Still crazy after all these years” (In the song: *Still crazy after all these years*:1974).

To my mind, meditation techniques and other relaxation techniques can be subjected to scientific scrutiny[19].

In addition to the fact that physiological responses, brain wave patterns, and psychological indicators can be analyzed, also a possible field effect of consciousness can be scientifically investigated. The TM organization claims that the TM technique does not only affect the practitioners themselves, but also persons in their (immediate and distant) surroundings: the so-called Maharishi-effect. Especially when groups of meditators practise advanced TM techniques -the TM-Sidhi program- an influence of harmony, coherence and orderliness would be radiated. The enhancement of the quality of individual consciousness would radiate throughout society via the field effect of collective consciousness[20]. The quality of life in society would be governed by the quality of the collective consciousness, i.e., the coherence and the degree of enlivenment of transcendental consciousness in the collective consciousness. Since collective consciousness influences -and is influenced by- individuals, stress in the collective consciousness can be 'released' by individuals. With only one percent of the population practising TM, or the square root of one percent of the population participating in the group practice of the TM-Sidhi program, the field effect would

19. Sheldrake (1991:188) refers to a number of international movements which in the 1980s involved millions of people in praying for peace. According to Sheldrake the power of prayer has played some part in the thawing of the Cold War. He continues by saying: "..sceptics believe that it would have happened anyway. Either way it is a matter of belief or opinion; it is no more possible to prove that prayer played no part than to prove that it did". One can argue that the power of praying is mere wishful thinking, self-deception or random coincidence. But one can also approach the matter from a more scientific point of view, and actually investigate the effects of such undertakings. In my view sound scientific research *can* investigate these *effects*, even if we do not understand exactly how these effects come about, and even if the issue of causality and directionality is difficult to handle. As we will see later on in this section, the TM movement has made it plausible and probable that a 'field effect' of consciousness exists. This has been made possible by the characteristic that the TM technique, presumably, works at a 'deep' level of consciousness, and therefore is relatively effective so that only small numbers of people are needed to bring about wide-ranging 'field effects'. It might be difficult to assemble millions of praying people at a specific place for a specific period of time in order to implement a scientific experiment.

20. We can use the following analogy to clarify the field character of collective consciousness: the abstract, immaterial 'collective consciousness' operates as a field in the same way as a magnet does. A magnet covered by a sheet of paper is invisible, and its magnetic field cannot be seen until small particles of iron are put on top of the paper, and automatically are organized in coherent patterns. In a similar vein the field effect of collective consciousness shows up in the behavior of numerous individual actors. Radio, TV, and radar work by sending waves through an unbounded, infinite, unmanifest, and all-pervading electromagnetic field. Although these waves cannot be seen, they have their effects. "As the basic mechanism of nature, invisible, immaterial waves move through invisible, immaterial fields. ... ..consciousness, too, is an infinite, invisible field - with waves that radiate throughout society" (Oates 1990:24,25). The concept *field* is not only a 'guiding image' but also an unmanifest reality.

Everybody knows that music -just vibrations in the air- can deeply affect people. Rhythm can result in altered states of consciousness (Huizer 1996). Music can through a field effect lead to mass hysteria (the early days of the Beatles and Stones) but also to a healing form of interconnectedness. At live performances the 'tuning in' to the music and to the rest of the audience can have great positive impact. Music, singing and dancing are vibrations, expressions of creative intelligence (see footnote 24 in chapter 8). A 'high quality' collective consciousness of audience and performers results in concerts characterized by interconnectedness. Says Keith Richards: "In principle [collaboration in a band] is not something intellectual that you can think up, and put up just like that. It just has to be there. You will have to find it. Suddenly everybody knows what they have to do. And that are the magical moments. Suddenly you have the feeling as if you are three meter long and are floating in the air. That is what I always have lived for - the moment a band is on the same wavelength" (in: Bockris 1994:74) (translation from a Dutch text).

emerge[21]. An improved quality of life in society -as expressed in decreased crime, violence, accidents, and illness, and improvements in economic conditions and sociological indicators- would be the result. In short, the TM organization claims a *holistic* and *measurable* influence of progress. Evidence to support this claim, provided by scientific research, has been published in leading, refereed scientific journals such as *Journal of Mind and Behavior* and *Journal of Conflict Resolution*. In order to get the research findings accepted and published, rigorous statistical methods have been used, such as 'time series analysis' which controls for long-term trends, cycles, and seasonal influences in the social indicators being studied.

Box 20: Scientific research on the field effect of consciousness

In one research paper five studies, conducted in different parts of the world, were combined. These studies tried to assess the effect of sufficient-sized groups of participants in the TM-Sidhi program on the quality of life. In three studies the effect of large groups of meditators on crime rate was investigated: crime dropped markedly -with statistically significant results- in the areas where the meditators were assembled (in the Union Territory of New Delhi, in the national territory of Puerto Rico, and in Metro Manila). Additional studies in the Philippines and the state of Rhode Island in the U.S. generalized these findings to more comprehensive indices of quality of life. This paper was published in the *Journal of Mind and Behavior* (Dillbeck et al. 1987). Russ, editor of this journal and professor of psychology at the University of Maine, said: "On the one hand, the paper was based on an extremely unconventional idea. On the other hand, this idea was backed up by rigorous statistical analysis, at a level of mathematical sophistication rarely seen in psychological or sociological studies" (In:Oates 1990:53). After the paper had been submitted to referees (experts in psychology and an expert in statistical analysis) Russ decided to publish. Said Russ: "The statistical evidence was persuasive. ... I'm afraid that many times, new ideas don't lose out on their merits. They lose out because established people in the field don't want to see their power eroded by new ideas which threaten their expertise and authority. ... I didn't see how I could deny that paper publication" (ibid.). Another study, published in the same journal, reported on changes in crime rate in large random samples of U.S. cities and metropolitan areas in the 1970's, and in the district of Colombia in 1981 to 1983. Also this study gave evidence for a causal influence of TM program participation in decreasing crime rate (Dillbeck et al. 1988).

In another study the effect of a group of meditators assembled in Jerusalem on crime, traffic accidents and fires in Jerusalem, on the Israeli stock market, and on open warfare in neighbouring Lebanon was investigated (Orme-Johnson et al. 1988). The struggle for publication of the results in the *Journal of Conflict Resolution*, edited at Yale University, took more than three years. Russett, editor of this journal and professor of political science at Yale, sent this unconventional study to four different referees, two more than the usual practice. After also the most critical referee agreed that the application of statistical methods for hypothesis testing was commensurate with his standards for scientific research, Russett decided in favor of publication (Oates 1990:65). In an unusual 'Editor's Comment' which was printed with the research paper Russett said: "The following article presents and tests a hypothesis that will strike most readers (myself included) as, to say the least, unorthodox... Yet the hypothesis seems logically derived from the initial premises, and its empirical testing seems competently executed. These are the standards to which manuscripts submitted for publication in this journal are normally subjected" (*Journal of Conflict Resolution*, vol.32, no.4, December 1988; and in:Oates 1990:65). In this study the correlation between the number of participants in the TM program and the statistical changes in society was so strong that "there was only one chance in ten thousand that the results could have been coincidence" (ibid.:62). Correlation, of course, does not imply causation and "..even high correlations cannot be said to prove a causative influence of one upon the other. Nevertheless, researchers routinely make informed deductions from their statistics" (ibid.:65). The evidence strongly supported a causal interpretation. The application of a stringent statistical test -the use of transfer functions to identify the *direction* of causation- pointed from changes in number of meditators toward declines in war deaths, crime, and traffic accidents rather

21. With a population of 1000 individuals, for example, 10 persons would have to practise the TM technique, but only the square root of 10 = 3 to 4 persons would have to participate in the group practice of the TM-Sidhi program. Scientific research indicates that these percentages are sufficient to generate a field effect.

than the other way around. While alternate explanations (for example, weather and holidays) were statistically ruled out, researchers were left with only one conclusion: higher numbers of meditators resulted in positive changes in society. An important aspect of this study was that precise predictions of the results were made in advance: it was a prospective study rather than a retrospective study. “The clear-cut predictions, made months before the study took place, made clear that statistics were not being chosen after the fact simply because they happened to work” (ibid.:55). Davies (1988) showed in his doctoral dissertation that even under the extreme conditions of protracted political violence in Lebanon large assemblies of coherence-creating groups in the U.S., Israel, Lebanon, Yugoslavia, and The Netherlands had an extremely significant positive influence on the Lebanese conflict. In this multiple-replication study the dependent variables -daily cooperation among antagonists, war intensity, and war-related fatalities and injuries: blind scored by an independent Lebanese- all had p-values <.00001.

Orme-Johnson, Alexander and Davies published in 1990 in the *Journal of Conflict Resolution* a reply to methodological critique on their earlier 1988 paper. One point of critique was that because of their theoretical commitments they might have been prone to see results where they were not evident, and that the use of complex statistical techniques only might have magnified this problem. Above authors argue, however, that the results are so obvious that they can be seen in graphs of the raw data with no statistical analysis. If the independent variable (group size of meditators) is plotted against the overall quality-of-life index, the covariation is quite striking and obvious (Orme-Johnson et al. 1990). It is clear that these research findings challenge the paradigm of contemporary social science, but a new theory must not be rejected simply because it is new or “sounds too good to be true” (Orme-Johnson et al. 1988). What is considered implausible or ‘paranormal’ today, may be the norm tomorrow. Orme-Johnson and his colleagues argue that the key test in social sciences is replicability of results, and point out that forty other studies replicate the field effect of consciousness on a city, state, national, and international scale (e.g., Cavanaugh 1987; Dillbeck et al. 1987, 1988; Dillbeck 1990; Gelderloos et al. 1990; Orme-Johnson et al. 1989). They end their 1990 article in the *Journal of Conflict Resolution* as follows: “In conclusion, we have shown that our original study not only exceeded the standards for field research in international conflict but that reanalyses actually strengthen our original findings. Even if there were not already forty replications, the striking results of this study alone would warrant serious consideration. Clearly, the social sciences are desperately in need of conceptual progress and applied technologies for solving the problems of society. Consistent confirmation of the [field effect of consciousness] would provide an empirical basis for developing a new field-theoretic model of international relations consistent with the major advances in the physical sciences during the past fifty years. It would also make available a noninvasive, highly cost-effective technology for promoting conflict resolution and improving quality of life on an international scale” (Orme-Johnson et al. 1990).

A study published in the *Social Science Perspectives Journal* (Orme-Johnson et al. 1988) revealed that a higher number of meditators in the U.S. and a large national coherence-creating group in Iowa were associated with significantly improved quality of life in the U.S. as expressed in a quality-of-life index composed of 12 social indicators: crime rate, hospital admissions rate, infectious disease rate, infant mortality rate, suicide rate, cigarette consumption per capita, alcohol consumption per capita, GNP per capita, patent application rate, divorce rate, educational degrees per capita, and traffic fatality rate.

In another, fine-grain longitudinal study (based on week-by-week data) there was a strong inverse correlation between the number of participants in the permanent group of meditators in Iowa and the statistics on violence in the U.S. (homicides, suicides, and traffic fatalities). This study was published in *Social Indicators Research* (Dillbeck 1990) - “a journal which has a daunting statistical reputation” (Oates 1990:83)..In yet another longitudinal study, using month-by-month data, a strong and statistically significant inverse correlation was found between changes in the size of the group of meditators in Iowa and changes in U.S. economic performance, as expressed in a misery index - a combination of the inflation rate and the unemployment rate. This study was published in the proceedings of the *American Statistical Association* for 1989 (Cavanaugh et al. 1989).

The research findings presented in Box 20 strongly suggest that a field effect of consciousness is at work, an effect that is *holistic* in nature since various indicators of the quality of life are simultaneously affected. In a similar way as an electromagnetic field mediates action-at-a-distance, the field of collective consciousness mediates inter-human effects at a distance. These non-local effects are mediated through the agency of the field of transcendental consciousness (Orme-Johnson et al. 1988: *Journal of Conflict Resolution*). In addition to mediation by verbal communication in direct social interaction -as practised in, for example, soft systems thinking-mediation of behavioral effects at a distance through consciousness warrants more attention. One can argue, as Vanheste (1996) does, that the electromagnetic field is a physically measurable reality because it contains energy. The fields of collective and transcendental consciousness do not contain energy, and therefore cannot be detected with scientific instrumentarium. The field of transcendental consciousness (or creative intelligence) can be understood as a field of *potential* energy, energy which *can become manifest* in vibrations, waves, small and large particles, and thoughts and actions. The everyday 'objective' world is a manifest expression of this creative intelligence: it is a *map* which can be 'objectively' investigated. Scientists as mapmakers can investigate the field *effects* of consciousness, they can map these effects in the 'objective' world, but they cannot 'prove' the existence of the consciousness fields themselves. Scientists as trans-subjective meditators, however, can verify the existence of the field of creative intelligence in their own consciousness (section 8.4). Although scientific research on the field effect of consciousness provides only *indirect* evidence for the existence of the consciousness factors, the *replicability* and *predictability* of this effect is so persuasive that it certainly warrants further attention from scientists[22]. The research on the field effect of consciousness, as presented in Box 20, shows how difficult it is to publish unconventional research findings, even if one adheres to the most rigorous statistical tests. The history of science is "a history of repeated collisions between old understandings and new evidence" (Oates 1990:60). "Rather than reject the old paradigm [scientists] have frequently preferred to reject the new evidence" (Russell 1990:181). Old paradigms are emotionally

22. In the view of Tangelder (1994) the field of consciousness does not contain energy, but nevertheless, he says, it can influence random events and chance, as shown in experiments with random number generators. People can influence the workings of such machines with the power of attention, the results of experiments with these fully automated testing systems are statistically significant. Two researchers from Princeton's engineering department, Jahn and Dunne (1987), report deviations from randomness on the order of 18 percent (Chopra 1991:212). In a meta-analysis containing 285 such experiments, the final outcome was that 585,000 experiments with no results were needed to neutralize the significant result (Gerding 1996). In the view of Gerding (1996) the question 'do you believe in parapsychology' is as weird as the question 'do you believe in chemistry' since parapsychology employs methods and techniques which are generally accepted in science; the design and evaluation of experiments conforms to the rules of 'normal' science. Similarly, I argue that if you do not believe in the outcomes of the scientific work on the field effect of consciousness, you cannot believe in the results of any (social) scientific work published in peer-reviewed journals. On the basis of both a theoretical framework (the transcendentalist paradigm) and empirical research I argue that the field effect of consciousness warrants serious attention. Moreover, Gerding (ibid.) observes that the so-called 'objective' aspect of reality in positivist science refers to the objective character of an *intersubjective* world - a world which we call objective because we share this world. Our shared world is created by a shared mind - the collective consciousness. When this collective consciousness changes, our shared world changes, and results of so-called 'paranormal' research might be easier accepted. Also the research on the field effect of consciousness has been labeled 'paranormal' by critics (Schrodt: in *Journal of Conflict Resolution*, Vol.34, No.4, December 1990). The negative connotations that paranormal research typically invokes, might bias readers against assessing the quality of this research on grounds that are normally accepted in science (Orme-Johnson et al. 1990). Finally, I would like to repeat here a remark of Tangelder (1994), who says that in science 'the number of believers' cannot (and should not) be used as a scientific argument. In science the principle 'the majority rules' should not apply.

difficult to forego, and Kuhn (1970) has observed that paradigm shifts usually take about 30 years after the experimental evidence is in.

The research on the field effect of consciousness suggests that a 'high quality' collective consciousness results in a *harmonic* atmosphere, which in turn facilitates social learning, the development of high quality collective agency, and the emergence of synergy[23]. Summarizing one can argue that the TM technique has two effects: the performance of meditators is enhanced, and meditators contribute to a 'higher quality' collective consciousness, which through its field effect translates into facilitation of societally friendly behavior with others. Changing oneself automatically changes the world.

9.5 The transcendentalist paradigm: consciousness-mediated manageability

In this section the transcendentalist paradigm will be discussed. I have chosen for the name 'transcendentalist' paradigm because of the centrality of the notion 'to transcend' in this paradigm. The transcendentalist paradigm remains difficult to comprehend, *and* without *practical* value, if one cannot 'transcend' the continual identification with the rational-empirical consciousness[24]. I focus on the first criterion in Table 8 -ontology- since all other criteria (except role of intuition, which will be discussed in chapter 12) have already been covered in earlier chapters. The ontological question deals with beliefs about the nature of reality - the nature of being (section 6.1). In my view the explicitation of such beliefs must precede the explicitation of epistemologies (see also section 10.1). A central tenet in the transcendentalist paradigm is that knowledge and reality are structured in consciousness. Sensory perceptions and intellectual interpretations of the world around us differ in different states of consciousness. Although we live in a socially-constructed 'objective' world, this inter-subjective aspect of the 'objective' world is -in the perspective of the transcendentalist paradigm- grounded in a field of transcendental consciousness, a field of creative intelligence. Transcendentalists believe that this universal, autonomous, non-contextual field is the ground of everything that exists - people and nature. When awareness of this underlying field *and* awareness of the 'objective' world are both present, then one experiences the paradoxical co-existence of a *universal*, unchanging world and a *relative*, continuously changing world. The universal world can be characterized as a 'Ding-an-Sich' which manifests itself in the relative world, but simultaneously remains completely independent from the relative world - i.e., paradox abounds. In section 8.4 we

23. A *harmonic* atmosphere is not something esoteric. Most of us are familiar with the phenomenon that we 'feel' or 'sense' the atmosphere in a room or house we enter. Swanson & Oates (1989:164) say: "Managers know that there is a collective air about their people - an overall tone that may be optimistic and energetic or sullen and hostile. This collective consciousness is a summation of the individual moods and minds". We always -albeit unconsciously- radiate vibrations which have an impact on other 'beings', and we continuously receive vibrations. This 'radiating power' might underlie sayings such as 'action is reaction' and 'as you sow, so shall you reap'.

24. In most cases 'transcending' is interpreted as 'going beyond'. According to Chopra (1997:94) 'going beyond' is not an accurate description, since "there is no distance to cover; spirit never leaves us, it is only overlooked. .. ..a better way to describe transcending is 'seeing beyond'. What can you see beyond the apparently solid facade of life, the constant flow of time, the limitations of space, and the laws of cause and effect? If the answer is very little, the reason is that your perception has not been trained for such vision". Chopra refers here to the simultaneously transcendent and immanent aspect of spirit/Spirit (section 8.4).

have seen that a distinction should be made between the transcendental and immanent aspect of spirit/Spirit. In Diagram 12 the transcendental consciousness factor represents the transcendental aspect, while the immanent aspect is represented by the word 'Spirit' outside the diagram (see also Diagram 11 in section 8.4). The immanent aspect of Spirit encompasses all categories in Diagram 12 and is, therefore, represented by the paper on which the diagram is drawn. The categories 8 to 2 in Diagram 12 constitute the relative world, while category 1(spirit) and Spirit constitute together the universal world. These relative and universal worlds can be distinguished but not separated. I have labelled the ontological position of transcendentalists 'psychic monism' since they believe that the whole of creation emerges from the field of transcendental consciousness (the term 'psychic monism' stems from the 19th century German philosopher G.Th. Fechner: in Van Dongen 1996).

The question to what extent the ontology of the transcendentalist paradigm corresponds with ontologies of East African people is not subject of this study, but certainly warrants further investigation. Here I just want to quote the Belgian missionary Tempels who said, in the mid forties, the following about Bantu people:

> "What has been called magic, animism, ancestor-worship, or dynamism -in short, all the customs of the Bantu- depend upon a single principle, knowledge of the Inmost Nature of beings, that is to say, upon their Ontological Principle. For is it not by means of this philosophical term that we must express *their knowledge of being*, of the existence of things? ... For primitive peoples the highest wisdom consists in recognizing a unity in the order of beings in the universe from which they do not idiotically exclude a priori the spiritual world. Their whole ontology which can be systematised around the fundamental idea of 'vital force' and the associated ideas of growth, influence and vital hierarchy, reveals the world as a plurality of co-ordinated forces. This world order is the essential condition of wholeness in human beings" (Tempels 1959: quoted in Huizer 1995).

The principle of a 'vital force' which underlies the whole universe seems to correspond with the concept of a field of creative intelligence[25]. The Bantu vision that 'wholeness in human beings' depends on 'a plurality of co-ordinated forces in the world' reminds me of the (related) concepts holism and sustainability. The multi-facets of sustainable rural development include ecological responsibility, technical feasibility, economic viability, ethical defensibility, social desirability, and aesthetic acceptability (Bawden 1995) (section 1.2). To this long list I would add *consciousness-mediated manageability* because in the perspective of the transcendentalist paradigm a field of consciousness manages and coordinates these multiple aspects of sustainable development. Harmonious governance of all these aspects -a synchronized and compatible cultivation of synergy in the mix- is facilitated by a 'high quality' collective consciousness. A holistic approach does not only pay attention to all aspects of rural development, but acknowledges also that the whole is more than the sum of its parts. Sustainability can be defined as 'the emergent property of a soft system' (Bawden & Packam 1991). It is the "negotiated outcome of collective action of the human stakeholders in the ecosystem" (Röling et al. 1997) (see also footnote 6 in chapter 6). I argue that in addition to negotiated agreement, also experiential spirituality is important.

The ten criteria used to characterize the transcendentalist paradigm form a consistent, internally coherent complex. Nevertheless, the paradigm remains a historically-situated and socially-constructed mental concept. More important than the paradigm as such is its main methodology -

25. Whether the ontology of Bantu people (or Tempels' interpretation of this ontology) could be a case of pre/trans fallacy 2 remains to be investigated. See also section 8.3 and footnote 14 in chapter 8.

techniques for consciousness development- which (preferably) must have a positive impact on all four dimensions of human existence: the intra-human dimension (body-mind coordination), the inter-human dimension (person-person), the extra-human dimension (person-nature), and the trans-human dimension (person-spiritual dimension) (Van Steenbergen 1996). The goal is ‘wholeness in human beings’ and ‘wholeness in society’. Sustainability is -just like health- an integrative, holistic property. By working at the most fundamental level of our consciousness -a level that is common to and integrates all aspects of individual functioning- a balanced, integrated functioning of the whole is enhanced. In contrast to the approach of modern medicine -often an unending exercise of treating symptoms- such a ‘deeper’ approach results in ‘wholess in human beings’ (Fagan 1995:73, 92) (see also Box 22 in chapter 11). In section 7.2 we have seen that the ‘emerging’ synergetic effect of interaction among a multitude of actors can be puzzling. If the concept ‘emergent’ refers to macroscopic properties that are the collective effect of microscopic events, then the question is ‘what organizes these microscopic events’. In the perspective of the transcendentalist paradigm it is a ‘high quality’ collective consciousness -enlivened by transcendental consciousness- that has such an ‘orchestrating’ quality. When we do not want to be the plaything of external circumstances, when we do not want to be directed by outside events, we will have to follow our own thread to the field of transcendental consciousness[26].

It has been argued that there is no simple positivist ‘techno-fix’ nor a constructivist-oriented ‘participation-fix’ in resource-poor farming (section 6.2). Similarly, there is also no transcendentalist ‘consciousness-mediated fix’. Consciousness development is not an overnight solution: it takes time, and the two other paradigms remain indispensable in the search for sustainable farming systems. Bawden (1995) recommends for FSR three ‘levels’ of inquiry: hard, soft and critical systems thinking (section 6.1). In my view the attunement of hard, soft and critical systems *thinking* is not hindered so much by the difference between hard, soft and critical as by the common element, i.e., the reliance on *thinking*-being as the only possible mode of being. Singh (1996) argues that we have to move from ‘doing’ and ‘talking’ to ‘being’ (in:Chambers 1997:214).

Box 21: An example of the complementarity of the three scientific paradigms

When agricultural scientists want to develop a new variety, they, first of all, need a vision. The *transcendentalist* paradigm can provide guidance in this respect, engagement in its main methodology facilitates the development

26. Hermann Hesse (1974:71) wrote in 1919: “There is one virtue that I love, and only one. I call it self-will. I cannot bring myself to think so highly of all the many virtues we read about in books and hear about from our teachers. True, all the virtues man has devised for himself might be subsumed under a single head: obedience. But the question is: *whom* are we to obey? For self-will is also obedience. But all the other virtues, the virtues that are so highly esteemed and praised, consist in obedience to man-made laws. Self-will is the only virtue that takes no account of these laws. A self-willed man obeys a different law, the one law I hold absolutely sacred - the law in himself, his own *will*”. ... “His self-will, like the profound, magnificent, God-given self-will that inhabits every blade of grass, has no other aim than his own growth. ‘Egoism’, if you will. But very different from the sordid egoism of those who lust for money or power!” (ibid.:74). ... “The soldier who kills enemies is always regarded as a greater patriot than the peasant who tills his land to the best of his ability. Because the peasant derives advantage from what he does. And in our strange system of morality a virtue that is useful or profitable to its possessor is always held in suspicion” (ibid.:75). Self-willed people obey the natural inner law -“the silent, ungainsayable law”- deep in their consciousness (ibid.:76). In the terminology of Diagram 5 in chapter 3 we would say that self-willed people emphasize the lower route. They ‘obey’ their basic attitudes, their internal norms and values. They listen to the ‘silent witness’ within (footnote 6:chapter 8).

of societally and environmentally friendly agricultural technology. Varieties for resource-poor farmers must be, for example, adaptable to various environments, and tolerant of low-external-input conditions. A 'life-supporting' vision will also not encourage the development of herbicide-resistant varieties created by genetic engineering (Fagan 1995). In the subsequent organization and management of the research process *constructivist*-inspired methodologies play a role. The various stakeholders in the development of new varieties meet on platforms for negotiation about detailed goals of the research process, and the use of human and other resources. The creation of high quality collective agency on such platforms is facilitated by a 'high quality' collective consciousness. When, finally, detailed objectives have been formulated and agreed upon, the know-*how* of the *positivist* paradigm comes in. Reductionist research methods are helpful in the actual breeding work in laboratories and fields.

The transcendentalist paradigm is a trans-disciplinary framework of concepts (a meta-theory) with a trans-disciplinary mode of inquiry. Trans-disciplinarity does not only refer to the multiple disciplines within the field of science, but refers also to a combination of science and spirituality (we will come back to this issue in chapter 11).

9.6 Conclusion

In this concluding section I will first briefly recapitulate the main problems encountered in FSR and in rural development efforts, and then look at them from the perspective of the transcendentalist paradigm. Smallholder farming in East Africa is *a way of life*, not a mere technological and economic activity (section 2.3). It is embedded in rural communities in which all aspects of life, i.e., the categories 8 to 1 in Diagram 12, play a role. In reductionist approaches the *irreducible integrity* or *cohesion* of farming systems easily gets lost. Holism's central theme -the whole is more than the sum of its parts- is not fulfilled. In order to go beyond integration in retrospect of sub-solutions developed by disciplinary scientists, and to preserve the *farming systems perspective*, the *art, craft and science of agronomy* must be (re)established (section 7.4; Diagram 9). Integration in retrospect does not result in *synergy*: interaction between disciplines during the research process is minimal or absent. This is due to difficulties of *inter*disciplinary collaboration in *multi*disciplinary teams. Moreover, farming systems are intermediary wholes (holons) which can never be completely seen from the perspective of disciplines, whether single-discipline trained specialists or interdisciplinary trained generalists look at them. They, inevitably, look *from the outside* to farming systems (section 7.2). *Even when* multidisciplinary FSR teams -including some generalists trained in interdisciplinary research- would operate as true *human systems*, then the farming system under study still might exhibit 'emergent properties' which might be overlooked. Only with a dynamic equilibrium of self-assertive and integrative tendencies holons function optimally and coherently, synergy emerges and 'wholes' become more than the sum of their parts (section 7.2). This applies to FSR teams, farm-households, and all other higher- and lower-level holons, i.e., to soft *systems.*

Scientific research on the effects of the TM technique strongly suggests that the quality of life in society is influenced by the *quality* of the collective consciousness, i.e., the coherence, and the degree of enlivenment of transcendental consciousness, in this collective consciousness. In Diagram 12 the collective consciousness factor is a more independent variable with an 'orchestrating' quality by virtue of its holistic field effect. The collective consciousness factor underlies the cohesion and coherence of systems. The 'quality' of the coordination of actions implemented by a multitude of actors in the rural development process, at different levels and in different disciplines, is a function of the 'quality' of the collective consciousness of that group of actors. A 'high quality' individual and collective consciousness *facilitates* the cultivation of societally and environmentally friendly behavior. I believe that both negotiated agreement (rational morality) and experiential spirituality play a role in the development of a sustainable society. Both routes in Diagram 5 are important. Access to transcendental consciousness does not automatically result in effective action in the domain of existence. Relevant knowledge and practical skills -which are learned, constructed and evaluated in the upper route- are also necessary. *Experiential spirituality, however, can guide the application of such knowledge and skills in a societally and environmentally friendly direction.*

The transcendentalist paradigm is characterized by consciousness-mediated manageability: non-local effects are mediated through the agency of the field of transcendental consciousness. My hypothesis is that this same agency facilitates the 'management' of the multiple aspects of sustainable development. Sustainability is an integrative, holistic property which encompasses 'wholeness in human beings' and 'wholeness in society'. In the perspective of the transcendentalist paradigm the 'art of fostering synergy' is facilitated by a 'high quality' individual and collective consciousness. In addition to the outward-oriented approaches of the positivist and constructivist paradigms, I recommend an inward-oriented approach which focuses on consciousness development.

The conclusion is that we learned more about F and M (Diagram 2 in chapter 1). The transcendentalist paradigm can serve as an overarching background (F) of FSR activities and rural development efforts, and it offers a practical methodology (M) to apply the ideas and concepts in this paradigm. Two main issues -holism and lack of countervailing power- have been elucidated with the introduction of the concepts 'fields of collective and transcendental consciousness'. Diagram 12 facilitates an integration of individual (actor-oriented) and collective (structure-oriented) approaches. The consciousness factors can help us to transcend the actor-structure dualism. Experiential spirituality has a role to play in the development of sustainable farming systems. Paraphrasing Van der Ploeg & Long (1994), I would say that (endogenous) rural development is -at least partially- 'born from within'.

The remaining main issues in FSR -interdisciplinarity and attitudinal factors- will be discussed from the perspective of the transcendentalist paradigm in chapter 11. First, however, we will re-visit the constructivist paradigm, the paradigm that underlies much of the work of social scientists engaged in rural development. This paradigm will be discussed from the perspective of the transcendentalist paradigm in order to further clarify the similarities and differences between the two paradigms.

10 THE CONSTRUCTIVIST PARADIGM RE-VISITED

10.1 The ontological side-step manoeuvre in constructivism

The ontological position of positivists, constructivists and transcendentalists is presented in Table 8 (chapter 6). While positivists presuppose an objective, materialistic reality which includes everything that exists, many constructivists leave aside whether the ultimate nature of 'objective' reality is materialistic or psychic. One could say that they assume an 'agnostic' position: they 'bracket-out' the actuality of an 'ultimate reality'. Agnosticism, however, is not the same as atheism (Van den Belt 1995b). Van den Belt (1997:4) speaks of a bewildering diversity of different constructivisms, and following Hagendijk (1996), distinguishes two broad varieties of constructivism: *moderate* and *radical* constructivism. In *moderate* constructivism the term 'construction' refers "exclusively to the formation of knowledge about natural reality, not to that reality itself or its constituent objects" (Van den Belt 1997:19). *Moderate* constructivists are *epistemological* relativists (ibid.:252). They either take a (methodologically motivated) *agnostic* stance toward 'objective' reality, or profess to be *ontological realists* with regard to natural reality - "although they do not allow verbal accounts of that reality to figure directly in their explanatory schemes" (ibid.:5, 252). In the latter case they take a stance as *common-sense realists* vis-à-vis reality (ibid.:19). *Radical* constructivists (for example, Latour and Knorr-Cetina) claim to have circumvented the entire epistemological debate between realism and relativism, but Van den Belt (ibid.:255), for example, argues that Latour's work represents a strange mixture of constructivism and realism. Latour is an agnostic constructivist as long as scientific controversies about certain entities are raging, but a dyed-in-the-wool realist with regard to the existence of those same entities after the controversies have been settled. Latour and Knorr-Cetina make the existence of objects depend on human knowledge, which amounts to "the fallacy of conflating ontology with epistemology" (ibid.:257). Radical constructivists assert that both 'nature' and 'society' are being 'co-produced' by science (ibid.:5). *Scientific realists*, on the other hand, believe in "the independent existence not just of stones, cats, dogs, trees (common-sense realism), but also of electrons, muons, black holes, curved space-time and many other unobservable entities posited by modern physical science (scientific realism)" (ibid.:258). Van den Belt (ibid.) argues that scientific realism is "committing itself heavily to *what is currently accepted in modern science*, in apparent contradiction to its own maxim that the ontological question should be settled before epistemic issues".

I wholeheartedly subscribe to the proposition in Van den Belt's thesis that also constructivists must distinguish between *knowledge* and *reality* (between epistemology and ontology). To my mind it is important that the ontological question about the nature of reality -the nature of being- is answered by constructivists. When moderate constructivists assume a position of *ontological realism* with regard to natural reality (common-sense realism of everyday life), then they also need to explicate the ultimate nature of, for example, 'stones' (and, preferably, also 'Stones' in the social world) (see also footnote 24 in chapter 8). Van den Belt (ibid.:262) insists on a difference in *ontological* status between, for example, hammers and electrons. In my view, however, the ultimate nature of both hammers and electrons resides in the field of creative intelligence, both are vibrations of creative intelligence. I would rather speak of a difference in *epistemological* status between hammers and electrons since knowledge about these two objects is gained in different ways.

At Wageningen Agricultural University the constructivist paradigm is an increasingly important mode of perceiving the world. Engel (1995:9), for example, is of the opinion that ill-defined problem situations in theatres of agricultural innovation do not permit us to search for ontological explanations: “We are far from being able to concern ourselves with ‘the essence of things or being in the abstract’... And I am not sure it is even a good idea to try”. In his view systems thinking does not provide us with “an ontological account of what the world *is*” (ibid.:27). Instead practitioners need a coherent intellectual framework, an *epistemology* that can be used to understand and intervene “in the rich and surprising flux of everyday situations” (Checkland & Scholes 1990:24). Another Wageningen scholar, Leeuwis (1993), says:

> “I do not dispute that there somehow exists an objective natural world. This natural world ‘produces’ significant triggers and feedback that human beings would be wise not to ignore. Moreover, it cannot be denied that, although mankind has learned to manipulate and predict natural processes, such processes have an autonomy of their own (i.e., they do not react to what we say about them)” (ibid.:2). ... “..in arguing along the lines that I have chosen, one always ends up with the question whether or not ‘reality’, ‘an objective natural and/or social world’ or ‘truth’ exists... I will not go as far as some extreme relativists that there exists no such thing as objective reality or objective facts. Rather, I would like to conform to the position that Knorr-Cetina (1981) seems to take, namely that -from a social scientific perspective- it is *irrelevant* whether or not it exists, since for human beings it is fundamentally impossible to know it, even if it existed. All human knowledge is -in the end- temporary, selective, contextual and socially negotiated, and this holds equally for knowledge about what is commonly labelled the ‘natural world’ and the ‘social world’. ... Similarly, I do not wish to imply that ‘anything goes’. As Benvenuti (pers. comm.) rightly implied, any community or society must develop norms and criteria with respect to what is valid knowledge and what is not, if only in an effort to combat fascism and/or prevent environmental degradation and nuclear disaster. Nevertheless, it must be recognized that such norms and criteria are not neutral, and therefore there is reason to critically evaluate them regularly” (ibid.:109).

The question is then *what* creates the autonomy of natural processes, *what* ‘produces’ the triggers and feedback, and *where* do norms and criteria originate from. The fact that Leeuwis does not deny that somehow an objective, autonomous natural and social world exist, and that he does not want to take up an extreme relativist position, is in my view typical of the position of many constructivists. They proclaim that it is *irrelevant* whether or not an autonomous, non-contextual ‘reality’ exists, because we cannot know it anyhow. *It is fundamentally impossible to know such a reality, even if is existed.* This has been the dominant position in Western culture since Immanuel Kant. Kant asserted that human beings do not know the world-in-itself but rather the world-as-rendered-by-the-human-mind: no direct mirrorlike knowledge of an objective world can be claimed (Tarnas 1993:417). It seems to me that many constructivist-inspired scholars at Wageningen Agricultural University (e.g., Röling, Leeuwis, Engel, Van der Ploeg, Long) mainly think of constructivism as an epistemology, and tend to neglect its ontological aspects. If one claims to be a moderate constructivist *and* common-sense realist, why not explicate then the ultimate nature of the ‘objective’ everyday world? Ontology precedes epistemology, and without a clear ontological position ‘the fallacy of conflating ontology with epistemology’ will continue to frustrate scientific debates.

With regard to the ‘objective’ natural and social worlds the constructivist position that all knowledge about these domains is contextual and socially negotiated, is correct. With regard to the ‘universal’ world -‘the essence of things’- transcendentalists claim, however, that knowledge of this world can only be gained in direct, personal experience. In his search for the limits of human cognition Kant could easily sidetrack the ‘transcendence’ as scientifically irrelevant, because he and most of his contemporaries did not have direct experience of transcendental consciousness (Schulte 1984b,1984c). In science, however, the principle ‘the majority rules’ does not apply, and the number of people with such experiences cannot be used as a scientific argument (see also footnote 22 in chapter 9). The reluctance in contemporary academic philosophy to discuss the ‘grand questions’ of life, or to label them as ‘pseudo problems’ (Van Dongen 1996), seems inappropriate. In the perspective of the transcendentalist paradigm the autonomy of natural processes, and their triggers and feedback, are ‘produced’ by an underlying field of creative intelligence. One can call the existence of this field an ‘article of faith’ but for persons with regular access to this field it is a realistic statement of fact. What I am asking for is not faith - “only the willingness to explore inside and wait for the facts to emerge” (Chopra 1991:197).

The ontological positions in the three paradigms are summarized in Table 12.

Table 12: Ontological positions in the positivist, constructivist and transcendentalist paradigms

	Positivist paradigm	Constructivist paradigm	Transcendentalist paradigm
Universal reality	the everyday world, which can be ‘engineered’	irrelevant question	the field of transcendental consciousness
Relative reality	?	the everyday world, which can be ‘discussed’	the everyday world, which can be ‘transcended’

Positivists say that the universal reality is the materialistic everyday world, and when they believe in a transcendental reality this belief is strictly separated from their (scientific) work, or they believe that (transcendental) consciousness in the end can be reduced to physical-chemical processes. Constructivists say that the issue of a universal reality is irrelevant, and that the everyday world is an inter-subjective reality (they take up different degrees of relativist positions however). Trancendentalists, finally, say that the universal reality is the field of transcendental consciousness (the territory) while the everyday world is an inter-subjective, relative reality (a map).

Engel (1995:20) intends to contribute to “meaningful discourse and reflection [about the Knowledge and Information Systems (KIS) perspective] rather than to an ontological explanation”. One of the criticisms of the KIS perspective, however, is the confusion between its use as a practical tool and an explanatory theory. This critique points at “the ever growing need to develop a more ontological understanding of the social organization of innovation” (ibid.:50). To my mind the ontological side-step manoeuvre in constructivism can have as a consequence that all discourse, reflection and action remain within the continual identification with the rational-empirical consciousness. Since most actors do not realize that they rely on *thinking*-being only, they will not try to break this spell, and will not attempt to gain access to other modes of consciousness. The hesitance of many constructivists to take up an ontological position might imply that negative side-effects of a single reliance on the discursive intellect continue.

Holistic ambitions in systems thinking are often associated with the desire to design a single, comprehensive theory that answers many, if not all, questions. Engel (ibid.:33), however, does not entertain such a 'unified theory' aspiration: he refers to the need for "gaining *more* comprehensive ways [plural] of debating, not a unified scientific theory for understanding". In these postmodern times holistic ambitions often meet with suspicion. In the view of postmodernity totalization in any human endeavor is potentially totalitarian.

> "The pretense of any form of omniscience -philosophical, religious, scientific- must be abandoned. Grand theories and universal overviews cannot be sustained without producing empirical falsification and intellectual authoritarianism. ... Any alleged comprehensive, coherent outlook is at best no more than a temporarily useful fiction masking chaos, at worst an oppressive fiction masking relationships of power, violence, and subordination" (Tarnas 1993:401).

The central concept in 'the postmodern condition' is deconstruction: the deconstruction of all encompassing concepts and ideas. Postmodernism offers diversity *rather than* unity, difference *rather than* synthesis, fragmentation *rather than* totalization, and so forth (Rosenau 1992:8; in Van Steenbergen 1996). In postmodernism there is no place for grand designs. The possibility of a somewhat coherent vision on the future is flatly rejected, because such an encompassing vision inevitably would lead to a model of centrally administered rational society (Van Steenbergen 1996). Postmodernists believe that our society is inherently chaotic, and that this offers the best opportunities for individual freedom and development. Holists, on the other hand, emphasize a spontaneous and 'organic' process of development, they rely on self-organizing systems which will create 'order out of chaos' (ibid.). The ontology of the holistic-organismic philosophy of nature has been characterized as 'organismic' monism (section 7.2: Table 9)[1]. Although the anarchistic tendency of postmodernism appeals to me, some sort of 'guiding factor' seems to be indispensable. Postmodernity envisions a society characterized by pluriformity and fragmentation, while holism emphasizes cohesion and interconnectedness (ibid.). The assumption of both postmodernists and holists seems to be that a co-existence of such opposites is impossible. The transcendentalist paradigm, however, emphasizes that '*either/or*' and '*rather than*' can be replaced with '*and/and*'. In a similar way as a universal and relative reality can co-exist, the poles of other polarities or dualities can co-exist. Human life is full of such paradoxes which have to be transcended and 'lived' (see chapter 11). The transcendentalist paradigm offers a comprehensive, coherent outlook without falling into the trap of 'intellectual authoritarianism' since its main methodology focuses exactly on the liberation from the identification with the rational-empirical consciousness. The individual, free, anarchistic spirituality emphasized in this paradigm opposes any form of totalitarian behavior.

As soon as the postmodern philosophy of deconstructivism, historicism and contextualism claims to be a general rule, it becomes internally inconsistent (Harbers 1992). The ongoing discourse of people is not furthered with forced contextualism, which only leads to babble, not to debate - let alone to action (ibid.). Postmodernists who keep all variables variable, have no choice but to keep silent. It results in the 'unbearable lightness' of postmodern being (ibid.). The possibility of a comprehensive and coherent paradigm cannot be excluded (section 8.2).

1. The ontology of the transcendentalist paradigm has been characterized as 'psychic' monism (Table 8 in chapter 6). 'Organismic' monism would be another appropriate qualification. A third alternative is 'field-mediated' monism.

10.2 Ideal speech situations

An important concept in soft systems thinking is Habermas' notion 'ideal speech situation' in which undistorted communication can take place, so that consensus is based on arguments (communicative rationality) rather than on a strategic compromise (strategic rationality) (section 6.1: *type of rationality*). Scientists as a peer group do 'negotiate' about what is truth, but it is even more evident that at the interface of science and politics 'negotiation' is common practice (Van den Belt 1995b). In a process of negotiation between scientifc advisers and politicians the uncertainty of scientific research is translated into political certainty. The (unavoidable) uncertainty of scientific work is carefully 'filtered out' in order to generate 'clear and simple' texts for policy makers (ibid.). The tension between science and politics is evident in, for example, the field of the application of Geographical Information Systems (GIS). Although in principle the application of GIS can lead to more transparent decision making on the allocation of funds for development, it also elucidates the ineffectiveness of earlier planning exercises, and politicians nor planners are eager to give up their political power (Vogelezang 1996). Even when the process of negotiation between scientists and politicians would not be corrupted by personal interests and hidden agendas, one can wonder whether politicians would use scenarios developed by scientists. With regard to the influence of scientists on environmental policy, for example, experience teaches that a small disaster often helps more than a thick report (Hordijk 1993). A disaster attracts so much publicity that the public opinion forces politicians to take action. The public opinion is part and parcel of the collective consciousness, and since politicians, willy-nilly, are a mirror of the collective consciousness of their grassroots support, they 'automatically' take action. At such moments the collective consciousness is coherent, although this coherence has been externally induced and often quickly fades away. A 'high quality' collective consciousness, based on enlivenment of transcendental consciousness, would be more desirable. This would result in an *apriori*-willingness to act, based on basic attitudes, instead of an *aposteriori*-willingness to act induced by disasters (section 3.3).

For Habermas language is "the medium of communicational experience and action, and therefore a potentially important medium for structural change" (Leeuwis 1993:42). In the perspective of the transcendentalist paradigm language-mediated interaction is underlaid by consciousness-mediated interaction. Russell & Ison (1991) remark that what we share is "communication of the worlds we experience, we do not share a common experiential world" (in:Van Oostrum & Peters 1995). At the level of the 'relative' world this is correct, but what if we can share a 'universal' world in the field of transcendental consciousness? When our perception of the world and our communicative interaction are structured in consciousness, then it is evident that with widely diverging levels of consciousness among a multitude of actors consensus will not easily be reached. More attention for the factor that underlies perception, talking, argumentation, interpretation, knowledge, negotiation, and power, i.e., the factor that underlies all these *contents* of consciousness, seems appropriate. When communication-mediated interaction is supported by *(pure)* consciousness-mediated interaction, then the likelihood that all noses point in the same direction is enhanced because all actors directly experience, and intellectually understand, that they share a common basis - that they are holons in a larger system underlaid by a field of transcendental consciousness. When people experience a truly global interconnectedness, then it is more likely that the exploitation of nature and other human beings will decrease (this refers to the concept ‘ecological spirituality’ in section 8.2).

With regard to language-mediated interaction I want to stress that such interaction inevitably is based on a ‘principle of cooperation’ or ‘principle of charity’ (Franck 1996). Discussion-partners must start from the positive assumption that others, in principle, are intending to say something meaningful and useful: they must give one another an ‘advance’ of trust. Without such a basis of trust the meaning of contributions of others cannot be understood. Logical reasoning on the use of language points to the necessity of an expectation of a meaningful contribution of others: ‘trust pays off’ (ibid.)[2]. In the attempt of Habermas to establish a ‘moral-practical rationality’ this aspect of trust is essential. The assumption underlying communicative rationality is that a general consensus, in principle, must be possible, although it can never be guaranteed. Discussion-partners cannot earnestly debate, and *at the same time* assume that rational consensus (based on arguments) is not possible. This would be a contradiction in terms, and the discussion would be experienced as meaningless and hypocritical (Pijnenburg 1995). The transcendentalist paradigm facilitates a basis of trust: with a ‘high quality’ collective consciousness a harmonic atmosphere develops in which trust and ‘ideal speech situations’ can flourish.

In the context of language-mediated interaction it is significant to remark that the main methodology of the transcendentalist paradigm often does not rely on the *meaning* of words, but rather on their *sound* value. In the TM technique, for example, it is the sound value of mantras which has a ‘healing’ effect. Robbins (1991:210) argues that only about 10 per cent of the communication between people is transmitted by the meaning of words. The major share is transmitted by tone of the voice and physiology (body language). Covey (1990:270) distinguishes three different levels of communication, which are related to different levels of trust and cooperation among people (Diagram 13).

Low-trust situations are characterized by defensive, protective and often legalistic language: a communication which results in win/lose or lose/lose situations. In the middle position respectful communication is the dominant mode of verbal interaction. Says Covey (1990:271):

> “This is the level where fairly mature people interact. They have respect for each other, but they want to avoid the possibility of ugly confrontations, so they communicate politely but not empathically. They might understand each other intellectually, but they really don’t deeply look at the paradigms and assumptions underlying their own positions and become open to new possibilities. ... In interdependent situations compromise is the position usually taken. Compromise means that 1 + 1 = 1½. Both give and take. The communication...is honest and genuine and respectful. But it isn’t creative or synergistic. It produces a low form of Win/Win”.

High-trust situations, finally, are characterized by synergistic communication resulting in win/win positions: synergy means that 1 + 1 = >2. A synergistic position of high trust creates a ‘miniculture’ in which new possibilities emerge. My work experience belies the expectation that environments for synergy easily can be created (chapter 4). Covey’s description of situations in which respectful

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2. One can also say: “Seek and ye shall find” (Franck 1996). Or, in the words of Jagger & Richards: “You can’t always get what you want, but if you try sometime, you just might find you get what you need” (Song: ‘You can’t always get what you want’, The Stones, 1969).

communication and strategic compromise dominate, fits my experience with meetings, workshops, etc., quite well. I do not deny that under certain conditions constructivist-inspired approaches result in synergistic win/win situations, but these hitherto largely unspecified conditions need to be more closely investigated.

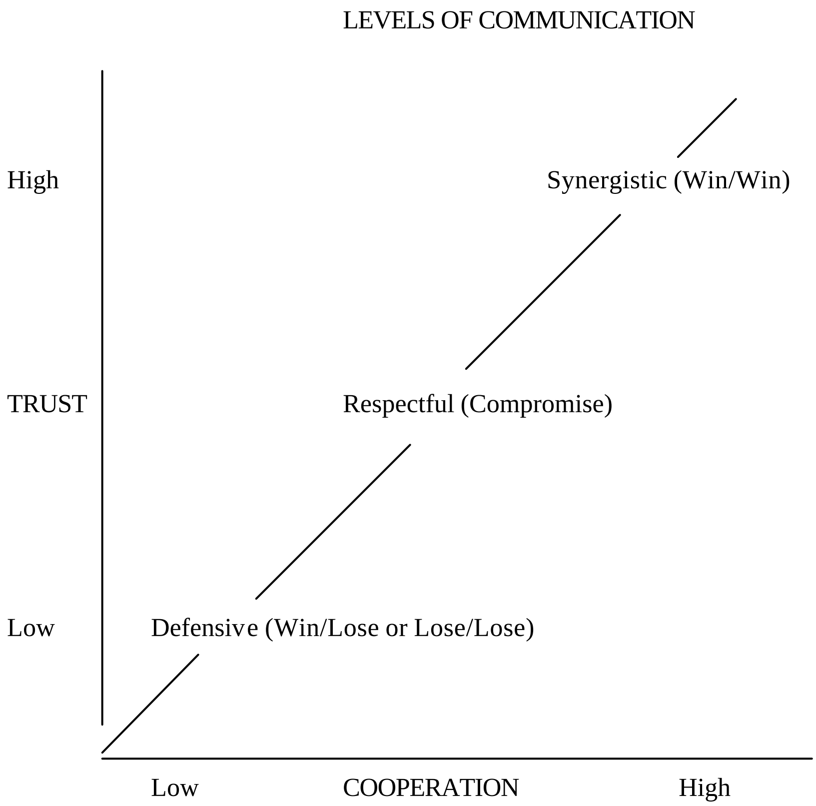

Diagram 13: Three different levels of communication in relation to levels of trust and cooperation (Covey 1990:270).

10.3 The orchestration of synergy

Engel (1995:24) emphasizes that the diffuse, social and often epiphenomenal character of agricultural innovation must be fully recognized - a lot ‘just happens’ (see also my points of departure in section 1.4). Since innovation processes are mostly self-guiding in nature -have dynamics of their own- it is necessary to pay more attention to the self-regulative capacities of social wholes (ibid.:45). It is important to achieve a balance “between direction and control on the one hand, and the creation and maintenance of space for serendipitous and epi-phenomenal improvements on the other” (ibid.:268). Apparently, planning of agricultural innovation processes is problematic[3].

3. This is confirmed by my work experiences in East Africa. I got the impression that agricultural development is often epi-phenomenal, or, at least, outside the control of the main actors. Says Engel (1995:269): “The fatalistic

> "The potential for synergy is to be taken not so much as an inherent property of a KIS but as a property which may emerge when certain conditions prevail. For example, when relevant actors *decide* to work together as if they were one 'system' (Engel 1995:37).

The ultimate objective of a KIS is synergistic performance of actors: it is the 'emergent property' which one tries to 'create'. Above remark by Engel implies that the actors in a system can 'orchestrate' synergy when certain conditions prevail. From the perspective of the transcendentalist paradigm the most important condition is a 'high quality' collective consciousness. According to Engel (ibid.:237) a participatory action-research methodology such as RAAKS (Rapid or Relaxed Appraisal of Agricultural Knowledge Systems) can contribute to 'group consciousness' and team building among team members, and it can help to create "an atmosphere of cordiality even among antagonistic and indifferent actors". RAAKS can serve as a catalyst to enthusiasm. But RAAKS does *not* guarantee the eventual *implementation* of proposals (ibid.:245). Unfortunately, an elaborated analysis of actual implementation of follow-up activities was outside the scope of Engel's study (ibid.:242). The important question is whether 'group consciousness' and enthusiasm persist after the RAAKS exercise is over. 'The pull of the normal' is strong, and colleagues may be sceptical or hostile (Pretty & Chambers 1994; see also footnote 5 in chapter 5). Participatory learning exercises certainly may create momentum among participants, but the crucial issue is whether this thrust can be maintained after the exercise, and whether others, who did not participate, can be motivated to take part.

Consensus for action is difficult because dynamic learning systems are characterized by *coherence through difference* (Bawden 1994). Communities or organizations can only retain coherence if they are "conscious of, and competent at dealing with, the differences" between individuals. Since individuals hold different ontologies, epistemologies, aesthetics, morals, logics and ethics, the possibilities for difference "when two or more individuals come together to seek consensual action for changes to shared events, must be many-fold more!" (ibid.). Experience at Hawkesbury College (the University of Western Sydney, Australia) has revealed that "it is not an easy task to encourage...'client' learners...to adopt systemic methodologies" (ibid.). The fact that a 'comprehensive and multi-dimensional and systemic' model of learning must maintain *coherence through difference* sounds paradoxical. Albert Einstein once observed that "the significant problems we face cannot be solved at the same level of thinking we were at when we created them" (in:Covey 1990:42 and Hamilton 1995:27)[4]. Synergistic cooperation is not a transaction (a compromise), but a transformation. The key to inter-personal synergy is intra-personal synergy (Covey 1990:274). Integrated personal development -synergy within ourselves- is necessary. In order to transcend the limits of our 'normal' conditioning -to transcend the dichotomous either/or choices, to find 'third alternatives' (ibid.:277)- we need to transcend the continual identification with the rational-empirical consciousness.

A critical issue in participatory learning situations is that active participation in debate and reflection depends on the *willingness* of relevant stakeholders to be active participants (Engel

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way extensionists react to the n-th top-down remodelling of their approach, or the way in which researchers accept another reorganization of their service surely helps to confirm such an impression". (See also: Goverde 1995:16).

4. See also Maharishi Mahesh Yogi's remark on 'solving problems on the level of problems' in section 9.4.

1995:216)[5]. Huijsman & Budelman (1996) remark: "whether people *want* something to happen can be more essential than any other factor". For this willingness to arise, people, first of all, must have a 'corporate awareness' of belonging to a system (Röling & Engel 1990). 'Corporations' (the word 'corporation' stems from the Latin word for body) must be bodies of people, they must be high synergy systems. Examples of 'external' pressures which can enforce synergy in 'human activity systems' are: government policy, market forces, subsidies, environmental degradation, other farmer groups, countervailing power, extension interventions, peer group pressure, etc. The label 'external' is somewhat unfortunate since such pressures first must be 'internalized' before they can have consequences (Leeuwis 1993:398). On the basis of my work experiences, a review of literature, and the transcendentalist paradigm, I argue that it is not always easy to 'enforce' synergy in 'human activity systems' through 'external' pressures. Synergy or holistic performance often entails a synthesis of (apparent) opposites (see chapter 11).

10.4 A psychological flip: out of the rational-empirical consciousness

Hamilton (1995:169) refers to synergy in the context of empowerment. Sponsoring organizations and their staff frequently have the erroneous notion that empowerment of clients diminishes their own power (see also section 5.1: *operational problem* 4). However, it is not a zero-sum concept of power which applies here. Power is not lost by one group and gained by another.

> "It is a synergistic definition with all the participants gaining increased power. ... While this study demonstrates that the staff and their organization actually gain power as their clients are empowered, this study also demonstrates that one has to experience this synergy to understand it" (ibid.).

'Positive-sum' and 'both-and' thinking are fruitful in the context of empowerment (Uphoff 1992: 280,343). When 'uppers' disempower themselves and empower 'lowers', all will gain (Chambers 1997:234) (footnote 17 in chapter 9). The intervention power of change agents and the countervailing power of farmers are a positive-sum. The key question is whether uppers have "the vision, guts and will" to change their behavior, and to act out such reversals (ibid.:236). Latour's argument that power is not a commodity that can be accumulated (section 9.3), can be intellectually understood but this does not necessarily imply a change in deeply engrained behavior. Bawden (1995) argues that the fundamental paradox in FSR is that FSR practitioners need to be able "to think in systemic ways in order to appreciate the advantages of thinking in systemic ways!". In a similar vein, Hamilton argues that synergy must be experienced before one really grasps its positive-sum effect. In his view pursuit of constructivist-inspired Participatory Learning and Action Research (PLAR) techniques requires changes within individuals and organizations, but these changes can only materialize through application of these techniques (Hamilton 1995:159,169). In PLAR changes

5. In this context the payment of 'sitting allowances' to attend meetings and workshops -a practice which is on the increase in East African countries- might be an omen. Although local salaries are distressingly low, one can wonder whether this is the right approach to stimulate active participation. Lipservice and 'formal' participation without real commitment are already serious problems, which are not going to be solved by paying 'sitting allowances'. See Box 4 in section 4.1.2 on topping up of local salaries linked to performance evaluation.

occur *in* the participants who *own* the changes (and consequently accept greater responsibility for them) (ibid.:168). Internalization of this approach requires actual engagement in PLAR techniques. But, *how* do actors gain the *initial motivation* to engage themselves in PLAR techniques? According to Chambers et al. (1989:104) the most effective way to change attitudes is to start by changing behavior through the adoption of farmer-first methods (section 5.1: *operational problem* 4). Says Chambers (1997:233):

> "It is easier, quicker and less dominating to provide opportunities for new behavior and experiences, than frontally to challenge belief systems. Changed behavior leads to changes in relationships, experiences and insights, which then in turn influence beliefs".

This refers to the feedback loop represented by arrow number 4 in Diagram 5 (chapter 3). To my mind, however, this feedback process is an unlikely route, it amounts to putting the cart before the horse. In the perspective as presented in Diagram 5 beliefs and attitudes underlie behavior, and although mutual interaction may occur, the primacy lays with beliefs and attitudes. It is evident from my work experiences that behaviors of actors (scientists, extensionists and farmers) cannot be easily changed (especially not when 'trivialities' such as demoralizingly low salaries and huge infrastructural bottlenecks are not addressed). If it would be so easy to influence beliefs and attitudes through engagement in 'new' methodologies such as FSR techniques and participatory approaches, why do client-oriented attitudes not spread like wildfire then? It can be safely assumed that virtually all FSR practitioners in East Africa have been engaged in training courses and numerous workshops, yet the impact on these practitioners (and the rest of the research establishment) has been modest after two decades. As indicated above, 'the pull of the normal' is strong: positivist-oriented thinking is deeply engrained in many of us, and the continual identification with the rational-empirical consciousness makes that we do not even realize it. If conventional professionalism in the TOT paradigm is to change, a 'psychological flip' is required (Rhoades 1994) (section 5.1: *operational problem* 4).

Says Chambers (1997:233):

> "The bottom line is to be nice to people. This is close to 'love thy neighbor as thyself'...[and he adds in an footnote]...I am embarrassed to be writing this moralizing stuff... But it would be wrong for this embarrassment to stop these things being said. For they matter".

Instead of only relying on the feedback loop, or to 'frontally challenge belief systems', a third alternative is to pay more attention to the lower route in Diagram 5. The first two alternatives depend on the discursive and practical consciousness, while the third alternative is enacted at the interface of the practical and transcendental consciousness. The assumption is that at this level of consciousness 'psychological flips' occur, resulting in 'basic attitudes' that facilitate the adoption of participatory methodologies. Scientific research on the TM technique suggests that levels of psychological maturity can be significantly improved (e.g., Alexander 1982, Gelderloos 1987) (section 9.4). The quality of participatory approaches depends heavily on the quality of the facilitators: professionals with both research and facilitation skills are needed (Engel 1995:252-53). The FSR experience shows that one has grossly underestimated how difficult it is to change attitudes of scientists and extensionists. When two decades of fostering inter-disciplinary collaboration in (relatively small and permanent) multi-disciplinary FSR teams were rather unsuccessful, how do we then 'enforce' group synergy on social platforms with a multitude of actors of different walks of life? At higher levels of social aggregation the task will become increasingly difficult. For the solution of complex societal problems such as sustainable development, natural resource management and reorientation of rural employment, we have to understand and facilitate ‘simultaneous multiple interface interactions’ (ibid.:271). How likely is it that the complicated task to manage these interactions among numerous actors -and between actors and the natural environment- can be accomplished by the discursive human intellect alone? A drawback of the Australian Landcare group model (a model which is frequently mentioned in the literature on participatory land management) is that integrated approaches harbour “the potential for people to be overawed by the scale and complexity of these issues, and to feel powerless to influence the forces shaping their lives” (Campbell 1996). There is emerging evidence that the effectiveness of participatory approaches in land management research and extension is limited by “social, cultural, institutional, structural and technical constraints” (ibid.). Apparently, the factors 8 to 3 in my holistic framework for multi-dimensional development (Diagram 12 in chapter 9) can hamper the implementation of such approaches. The transcendentalist paradigm claims to offer not only a leverage point with broad impact, but also to give people the opportunity to influence the path of development.

Röling (1997) distinguishes four ingredients of professionalism: technology, strategy, collective action, and spirituality (with regard to the last component he is not sure yet whether it will be helpful in developing more sustainable behavior). These four increasingly encompassing ingredients are supposed to tackle successively technical, economic, communicative, and ‘quality of consciousness’ problems. Technology and strategy have led to our predicament: the over-exploitation and destruction of natural resources are a consequence of the ‘successful’ positivist paradigm (ibid.). In order to conserve and regenerate the productive capacity of our natural resources, we need “negotiated agreement on what we shall call enough and on its distribution. We need to test Gandhi’s famous saying that there is enough for everyone’s need, not for everyone’s greed” (ibid.). In addition to constructivist-inspired methodologies to reach negotiated agreement, I suggest that techniques for consciousness development facilitate the development of a sustainable future.

10.5 Cosmovisions

Participatory processes must take into account all aspects of human life: the factors 8 to 1 in Diagram 12 need to be integrated in such approaches. Rural people’s ‘cosmovisions’ -including the interrelationships between people, nature and spirituality- cannot be neglected (Millar 1996:45) (section 5.1: *operational problem* 5). The international NGO ‘Compas’ (Platform for intercultural dialogue on endogenous development and cultural diversity), for example, does not exclude the spiritual aspect of farmers’ knowledge in agricultural research[6]. The holistic nature of the concept ‘cosmovision’ is important in the search for sustainable farming systems, but ‘visions’ need to be accompanied by practical and effective methods to realize them. According to Millar (1996: 163) the central notion in the cosmovision of the people in northern Ghana is the pleasing of the ‘Allfather’. In northern Ghana the ‘Allfather’ expresses ‘itself’ in the transcendental ‘forms’ of a

6. This NGO is based at ETC, Leusden, The Netherlands.

Christian or Muslim God, but also in a rain god, earth god, lineage god, ancestral spirits, fetish groves, and sacred lands and trees (ibid.:46).

> "It follows that this realm [the realm of the Allfather] would be pleased, and their pleasure is reflected in better harvests, and improved health of the people in subsequent years. The orchestration of strategies is for them essential in using a resource [land] which they jointly own with the dead, and the yet unborn. ... The pleasing of the Allfather, through the bodies that intercede on their behalf or intermediaries [soothsayers and earth priests], is their vision" (ibid.:163).

Also in other African societies spirituality plays a role in the facilitation of favorable environmental conditions such as rainfall and soil fertility, and thus good harvests (section 5.1: *operational problem* 5)[7]. In the terminology of the transcendentalist paradigm one would say that the 'Allfather' is the immanent aspect of spirituality which pervades nature and people. The 'pleasing of the Allfather' is the 'being in tune with the field of transcendental consciousness' which through a 'high quality' collective consciousness would result in 'support of Nature' - unfolding in good harvests and general wellbeing of the population[8]. Tempels (1959) speaks of a 'vital force' as the main principle in the cosmovision of Bantu people, a principle which underlies 'wholeness in human beings' and 'wholeness in society' (section 9.5)[9]. With reference to Schoffeleers (1978), Huizer (1995) remarks that ecological thinking in various Central African societies is characterized by the profound intuition that "management of nature depends on the correct management and control of society. ...irregularities in the social order, such as murder, incest, public immorality, are known to be followed by irregularities in the ecological order, particularly droughts". This does not make any sense in the positivist and constructivist paradigms, but in the perspective of the transcendentalist paradigm the ecological order and the social order are interconnected through the field of creative intelligence.

Participatory processes -also in the NGO sector- are often based on the agenda of the intervener: so far participation entails clients participating in the intervener's agenda and not vice

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7. Rist (1995) gives an example of a ritual in the Andean cosmovision, which -local farmers claim- has a positive effect on the quality and/or quantity of crops.

8. 'Support of Nature' is an expression often used by Maharishi Mahesh Yogi. When we 'tune in' to the field of creative intelligence, this orchestrating force supports us in all aspects of life. The responsibility for individual and collective adversity rests, ultimately, with ourselves. To be 'lucky' or 'blessed' gets a different meaning. Adversity could be interpreted as 'it's your own fault' - and, to a certain extent, that is the case. Remarkably enough, however, compassion with less 'fortunate' ones is not less in people with a broadened awareness. Exactly the opposite seems to be the case: only when your own problems are solved, you can be fully open and available to others. As long as you are entangled in personal hangups, you cannot devote much energy to others.

9. As remarked in the footnotes 14 (chapter 8) and 25 (chapter 9) it remains to be investigated whether the ontologies of the African societies described by Smuts, Tempels and Millar are cases of pre/trans fallacy 2 (section 8.3). If that is not the case, then one could argue that with such holistic ontologies African societies must be successful in all aspects of life. Today, however, many African societies face serious problems with regard to the economic aspect of 'development' (see Table 1 in chapter 1), and also at the social level difficulties are widespread (e.g., abuse of alcohol, increasing inter-generational problems, gender-related inequalities). Moreover, environmental degradation is on the increase. It seems as if effective methods to gain regular access to the 'vital force' or the 'realm of the Allfather' are not (or no longer) available. In the perspective of the transcendentalist paradigm a 'high quality' collective consciousness results in a high quality of life, including the economic and environmental spheres.

versa (Scheuermeier 1988; Guijt 1988; Millar 1996:33). A more appropriate mode of participation would be to have "interventionists participating in rural peoples on-going livelihoods; using the people's own logic, rationale, methods, concepts, and procedures" (Millar 1996:35). To this end Millar developed an Empathetic Learning and Action (ELA) framework, in which interveners get involved in "the overall learning and life-world of rural communities in a holistic manner" (ibid.). This ELA framework emphasizes indigenous learning processes in order to move participation a step forward. The 'democratic' ELA framework is a 'twin-track approach' with two parallel action programs running concurrently. On the one hand, interventionists enrol farmers in their activities, with researchers and extensionists dictating the rules of participation. On the other hand, farmers enrol interventionists in their style of participation (ibid.:169)[10]. Interventionists need to realize that they just plug in and out of the continuous learning process of local communities (ibid.:170). The ELA framework can be called 'democratic' since indigenous cosmology and knowledge are used to enhance the empowerment of farmers (Huizer 1995). Nevertheless, the dilemma of empowerment - the paradox of non-directive, participatory strategies- is that there is always a thin line between emancipation and manipulation (Long & Villareal 1994). In some situations it may be even necessary to provoke 'creative conflict' - another paradoxical issue (Cornwall et al. 1994).

Interventionists can intellectually understand and verbally accept the presence of an immanent (and transcendental) spirituality, but it will remain a 'vague' concept as long as it is not internalized in direct personal experience. When researchers and extensionists do not have first-hand experience of spirituality, farmers' cosmovisions will be respectfully accepted, but the communication will not become creative or synergistic (see Covey's description in section 10.2 of situations in which respectful communication dominates). Language-mediated interaction needs to be supported by consciousness-mediated interaction. Ideally, interventionists should walk into local communities without 'shutters or blinkers' on (Millar 1996:53), but that is easier said than done. All observation, interpretation and action are, inescapably, theory laden (section 1.4). In order to operationalize the 'twin-track' approach of Millar, it seems to be necessary, first of all, to explicate underlying ontologies -'theirs' and 'ours'- and, secondly, to experience the common basis of cosmovisions. This experience can foster the emergence of trust, respect and synergy. As long as spirituality is a blind spot in research and extension, farmers' participation is not really genuine: not all aspects of farmers' world views are included in the interaction between target group and change agent. Change agents need to realize that it is short-sighted (and a matter of belief!) to limit 'reality' to certain world views (Schilder 1996).

Millar (1996:170) points out that trust, respect and confidence building are prerequisites in his ELA framework. The attitude of the intervener is "the vital entry point, and it permeates the entire ELA process". An appropriate attitude requires a 'pre-conditioning of the mind' (ibid.: 172). Unfortunately, it remains unclear in his thesis *how* this 'pre-conditioning of the mind' can be achieved. One could argue that trust and respect are components of 'normal' ethical behavior, and that ethical behavior does not need a logical justification (and those ones who have such a justification often do not act accordingly) (Franck 1996). The difficulties encountered in the

10. Millar (1996:169) uses the notion of 'learning shades' to depict the informal, empathetic learning with farmers in the driving seat, taking place, for example, under the shade of a tree. This reminds me of the many pleasant hours that I spent in farmers' fields, sitting under a tree and enjoying their stories about field experiments, infrastructural bottlenecks, government officials, the past, etc.

introduction of FSR and participatory approaches indicate, however, that ‘normal’ ethical behavior is not an inherent characteristic of most change agents. In the literature on participatory (rural) development the cry for a change in attitudes is loud. In this study ‘attitudinal factors’ have been selected as one of four main issues, and the transcendentalist paradigm presented suggests that a ‘pre-conditioning of the mind’ is possible.

10.6 Conclusion

In this chapter the constructivist paradigm has been evaluated from the perspective of the transcendentalist paradigm in order to elucidate the differences between the two paradigms. An important difference is the hesitance of many constructivists to take up an ontological position. This ontological side-step manoeuvre can have as a consequence that all discourse, reflection and action remain within the continual identification with the rational-empirical consciousness. The single reliance on *thinking*-being continues. To my mind also constructivists must distinguish between ontology and epistemology. If scholars claim to be *epistemological* moderate constructivists as well as *ontological* common-sense realists, then the ultimate nature of the ‘objective’ everyday world needs to be explicated. Ontology precedes epistemology. This implies also, in my view, that moderate constructivists who take an *agnostic* stance toward the ultimate nature of ‘objective’ reality easily get entangled in the fallacy of conflating ontology with epistemology.

Constructivist-inspired soft systems approaches aim at the construction of ‘ideal speech situations’. The ultimate objective is synergistic performance of a multitude of actors. This synergy emerges ‘when certain conditions prevail’ but these conditions are not sufficiently specified. In the perspective of the transcendentalist paradigm language-mediated interaction must be supported by consciousness-mediated interaction. A ‘high quality’ collective consciousness facilitates the emergence of a harmonic atmosphere in which trust and ‘ideal speech situations’ can flourish. High-trust situations are characterized by synergistic communication and cooperation. Synergistic cooperation is not a transaction (a strategic compromise), but a transformation. While compromise means that 1 + 1 = 1½, synergy means that 1 + 1 = >2. The key to such inter-personal synergy is intra-personal synergy. More attention for the lower route in Diagram 5 (chapter 3) seems appropriate. It is not always easy to ‘enforce’ synergy in ‘human activity systems’ through ‘external’ pressures. At higher levels of social aggregation the task becomes increasingly difficult. Large numbers of highly skilled facilitators are needed.

Internalization of constructivist-inspired PLAR approaches requires actual engagement in these techniques. I maintain that the initial motivation to adopt such techniques is precisely the problem: first attitudes will have to change. Practical methodologies to change attitudes of change agents are not offered in the literature on rural development, except the recommendation to ‘just start’ with participatory approaches - in the (probably false) hope that the feedback loop in Diagram 5 will do the job. Agricultural professionalism consists of four ingredients: technology, strategy, collective action, and spirituality. Spirituality -in the sense of a ‘psychological flip’ out of the rational-empirical consciousness- is an encompassing ingredient which through a different ‘quality of consciousness’ can affect the other three components. Change agents can intellectually understand, and respectfully accept, the presence of an immanent and/or transcendent spirituality, but it will remain a ‘vague’ concept as long as it is not internalized in direct personal experience. In addition to explicitation of underlying ontologies of farmers and change agents, experience of the common basis of cosmovisions seems necessary. Cosmovisions as intellectual concepts certainly are a step forward, but not sufficient. They refer to contents of consciousness only.

Time and again, the continual identification with the rational-empirical consciousness crops up as one of the bottlenecks to the development of sustainable farming systems. One could argue that this is ‘rather logical’ since the transcendentalist paradigm could be seen as a self-constructed, theoretical framework which shows dangerous characteristics of a ‘vicious circle’ (see also the epilogue at the end of this study). In section 3.1 I referred to Giddens (1976:139-40) who says that logical circles are only vicious circles if their “closing is treated as an end-point of enquiry, rather than as a beginning”. Circular reasoning within scientific paradigms is -to a certain extent- inevitable, but such logical circles are ‘benign’ versions of the vicious circles that scientists fear so much (Franck 1996). Since this study is an *exploratory* endeavor -an attempt to break new ground for the development of sustainable farming systems- the transcendentalist paradigm is treated as the beginning of a new enquiry. An enquiry, however, which is not only based on an internally consistent framework -any ‘clodhopper’ can formulate theoretical constructions- but also on research findings which suggest that the concomitant methodology is effective.

The final conclusion is that we learned more about F, M and A (Diagram 2 in chapter 1). Constructivist-inspired ideas and concepts (F) and participatory methodologies (M) have been elucidated from the perspective of the transcendentalist paradigm. We have also learnt that attitudes of actors in the field of rural development (A) -especially facilitators and other change agents- require modification. In addition to the main issue ‘holism’, especially the problem of ‘attitudinal factors’ has been illuminated in this chapter. We are now at the end of Part II, a part in which the contours of a ‘new’ scientific paradigm have been outlined. The main issues ‘holism’ and ‘lack of countervailing power’ have been elucidated and adequately dealt with in this Part II. In Part III (Back to FSR) the two remaining main issues in FSR -interdisciplinarity and attitudinal factors- will be discussed from the perspective of the transcendentalist paradigm.

PART III

Back to FSR

11 FSR - AN ILLUSION OF INTELLECTUAL HOLISM ?

11.1 Pairs of opposites

*Inter*disciplinary collaboration in *multi*disciplinary FSR teams cannot be taken for granted (section 5.1: *operational problem* 15). Holism's central theme -the whole is more than the sum of the parts- is often put aside (section 7.3). In agriculture a view on the whole is indispensable: just like farmers, FSR practitioners must be all-rounders or generalists[1]. Unfortunately, both the motivation and ability of scientists to communicate across disciplines is limited by specialization (Horton 1984). In a world focused on specialization generalists are not greatly appreciated: specialists are the heroes of the positivist paradigm[2]. Experts, however, are, by definition, people who have blinkers on: that is their strength but also weakness (Kramers 1980). Ransijn (1985a:67) speaks of the 'blinkers of learned ignorance'. Specialization can be a useful, but also convenient choice which allows scientists to put unwieldy reality beyond their scope (Borgesius 1986). The important point is that specialization should start only *after* insight in the connections between disciplines -and between people and nature- has been obtained (ibid.) A holistic perception should precede specialization. According to Simmonds (1985: 57) multi-disciplinary thinking by individual scientists, who are able to transcend disciplinary boundaries, may be more important than multi-disciplinary teams[3]. Individual scientists must 'internalize' the farming systems perspective, and be able to communicate with scientists from other disciplines.

Two crucial issues in FSR are that a balance must be established between the professional interests of individual team members and the common interest of the team, and the attitude of team members towards interdisciplinary efforts must be genuine (Horton 1984). A dynamic balance between self-assertive and integrative tendencies is needed. Hermans (1986) refers to Koestler's two opposing but complementary tendencies as the Z- and A-motive. The two motives can co-exist, can be simultaneously realized. An example is the enriching contact with others, in which an experience of unity goes hand in hand with intensified self-expression (ibid.). In contexts of work and study the result is inspired commitment, dedication and enthusiasm: effort is accompanied by a

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1. Beets (1990:44) says that agricultural development needs a supra-disciplinary approach. "The farmer...is concerned with many factors simultaneously and his decisions have to be based on a multitude of factors and the interplay between them. If we fail to do the same, our perception of problems and potentials is likely to be unbalanced, and therefore of little practical use" (ibid.).

2. Hildebrand (1981b) remarks that the old idea of multidisciplinary work as being done by "undertrained generalists who have no strength in any discipline" must be replaced by that of "people who are strong in their own field, but who have enough confidence in their own work and enough respect for other fields that they do not feel the need to defend themselves from others nor be afraid to make contributions in fields other than their own".

3. An (unfortunately, very exceptional) example of an agronomist who used a 'holistic' approach, is Henk Waaijenberg who in his study on Mijikenda agriculture in Kenya focused not only on ecology, but also included agrarian history and policy (Waaijenberg 1994a). One of the propositions in his thesis is : "It is artificial to distinguish between sociology and agronomy, and harmful to separate them". The pragmatic attitude of Waaijenberg shows up in another proposition: "The proof of the pudding is in the eating. Therefore, researchers who claim that their work is relevant for the improvement of agriculture in the tropics should be given the obligation and the opportunity to test their ideas and put them into practice". This, of course, applies also to the ideas brought forward in this study.

sense of mission and job performance becomes like a personal assignment[4]. The Z- and A-motives transform one another into something new that is more than the sum of the parts (ibid.). The continual scientization of Western society goes hand in hand with a general attitude that emphasizes the Z-motive. Not only solidarity in social relations, but also the motivation to perform might be undermined in this way (ibid.). To my mind the 'magic' of holistic performance in FSR teams (section 7.2) emerges when the Z- and A-motives are simultaneously realized. Scientists need to balance ambition and competitiveness with self-transcending devotion to the task (Koestler 1989:196). Nonaka & Takeuchi (1995) argue that dichotomies can hamper the process of development of knowledge.

A balanced expression of Z- and A-motives is characteristic of integrated personalities (Gelderloos 1987:41). Hermans et al. (1985) suspect that both motives are simultaneously actualized in mystical experiences, since in such experiences "self-affirmation is maintained and becomes merged into a larger meaningful wholeness" (Gelderloos 1987:42). Maslow (1974:148) remarks that peak experiences are integrated and integrating experiences. In the view of Hermans personality emerges from the interaction of experience and (social) environment. However, the *basis* for having an experience and the 'stuff' out of which experience is made, is not elucidated in his theory (Gelderloos 1987:47). Gelderloos (ibid.) argues that "personality emerges from the interaction between pure consciousness and environment, and that it can be identified or linked with either pole". Personality is thus an *emergent property* of pure consciousness. In the continual identification with the rational-empirical consciousness the field of pure consciousness is completely hidden from view, and the personality "may appear to exist solely in relationship to the environment" (ibid.:48). Under that common (yet unnecessary) condition it is 'logical' to assume that personality cannot exist 'en soi' (ibid.). If personality, however, also 'interacts' with the field of transcendental consciousness, then the process of development of personality is also stimulated by this 'interaction' (this 'interaction' entails a merging of individual personality with pure consciousness). In this sense spirituality affects the development of personality (this refers to the lower route in Diagram 5 in chapter 3).

With regard to the co-existence of two opposing tendencies Schumacher (1977:121) speaks of *divergent problems*: problems with answers which diverge, and appear to be exact opposites. A divergent problem *par excellence* is the question 'what is the best method of education'. In the field of education freedom *versus* discipline is a pair of perfect opposites. Litt (1961) refers to this as 'Wachsenlassen' *versus* 'Führen' (In: Strasser 1976). In the view of Schumacher one has to mobilize higher faculties, such as love or empathy, in order to become a great educator. These higher faculties must be available "not simply as occasional impulses but permanently" (Schumacher 1977:123). Pairs of opposites are irreconcilable in ordinary logic: they demonstrate that "*life is bigger than logic*" (ibid.). A third factor from a higher level must be added in order to *transcend* the problem. The mobilization of higher faculties entails nothing less than "becoming better people" (ibid.:124). Real life -with all its unpredictabilities- is full of pairs of

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4. Koestler (1989:220) quotes Louis Pasteur who said: "The Greeks understood the mysterious power of the hidden side of things. They bequeathed to us one of the most beautiful words in our language -the word 'enthusiasm'-*en theos*-a god within. The grandeur of human actions is measured by the inspiration from which they spring. Happy is he who bears a god within, and who obeys it". In his book titled 'The ghost in the machine' Koestler (ibid.) says: "Once a scientist loses this sense of mystery, he can be an excellent technician, but he ceases to be a *savant*". See also footnote 26 in chapter 9.

opposites: justice *and* mercy, stability *and* change, tradition *and* innovation, public interest *and* private interest, planning *and* laissez-faire, order *and* freedom, growth *and* decay (ibid.:127). These problems cannot be 'solved' but a 'regular and reliable source of wisdom' can transcend them (ibid.:126). When life is a succession of divergent problems, which are "refractory to mere logic and discursive reason", then we have no choice but to embark on a journey of development which unfolds our "supralogical faculties" (ibid.:128). Divergent problems are insoluble on our 'normal' level of being. They have to be 'lived' at a higher level of awareness (ibid. 1989:102). Russell (1990:150) is of the opinion that 'balancing' of opposites -a synthesis of all polarities of human thought- requires a fundamental change in consciousness. Only trying to *think* of opposites simultaneously will not do. It must be a *dynamic* balancing of opposites: "not a compromise of opposites [but] a true synthesis of opposites in which both are enjoyed to the full and neither is appeased" (ibid.). Both opposites co-exist in harmony, are *lived* to the full as aspects of a higher reality. Assagioli (1972) gives the example of the opposites 'sympathy' and 'antipathy' with their compromise 'indifference' and their synthesis 'benevolent understanding' (In: Russell 1990:151). Also Wilber (1985d: 15) remarks that life comes in opposites. There is no light without dark, no inside without an outside, no pleasure without pain, etc. We would not be able to *realize* a feeling of pleasure without the background existence of pain. We can distinguish, but not separate pleasure from pain. "All opposites are mutually interdependent and inseparable, non-dual, *coincidentia oppositorum*" (ibid. 1989:145). We ourselves "slice [reality] up into innumerable pairs of opposites" (ibid. 1985d:29). In order to 'solve' our 'problems of living' we must be freed from the pairs of opposites. We must transcend both opposites: not good *versus* evil but *beyond* good and evil. According to Wilber this can be done by dis-covering a ground which *transcends and encompasses* both opposites (ibid.:27). All mystical traditions point out that "ultimate reality is a union of opposites" (ibid.:28).

The ability to transcend opposites is a quality of highly developed persons, or 'self-actualizers' in the terminology of Maslow (Rutgers van der Loeff 1976:31). Dichotomous thinking is characteristic of immature personalities; it is cause as well as consequence of being psychologically unhealthy (Maslow 1974:212). Maslow (ibid.:213) argues that self-actualizers *spontaneously* do what is good for them. In the perspective of the transcendentalist paradigm it is the field of transcendental consciousness that *integrates* all opposites. When this field is 'enlivened' in the mind, opposites are increasingly 'lived' in harmony (Ransijn & Schulte 1982:338). Scientific research on the TM technique indicates that individual overall performance (psychological health) can be significantly enhanced (chapter 9 and section 11.3)[5]. Although, to the best of my knowledge, research on the effect of techniques for consciousness development on performance of FSR teams (or other teams of scientists) has not been implemented, it is plausible that such techniques would have a positive impact. Team members with a 'high quality' individual consciousness would be able to transcend pairs of opposites, and the resulting 'high quality' group consciousness would make

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5. The transcendentalist paradigm suggests that instead of starting at the bottom and gradually moving up Maslow's hierarchy of human needs, it might be more effective to start at the top. In this 'highest-first' strategy one starts with the need for self-actualization. Improvement at this highest level will help satisfy all lower level needs: ego, social, safety, shelter and food needs will be easier fulfilled. Say Swanson & Oates (1989:151): "When people feel good about themselves on the inside, their ego problems diminish. Their social relations improve. And they are much more capable of earning their lowest-level needs: food, shelter, and safety". This 'highest-first' strategy is only possible, however, when practical and effective techniques for consciousness development are available.

that the whole is more than the sum of the parts. In 'high synergy systems' self-assertive and integrative tendencies are simultaneously realized (section 8.2).

The fact that life is a succession of divergent problems is demonstrated in Table 13. In this table I have listed pairs of opposites that I encountered in the literature studied. The pairs of opposites, dualities, polarities or dichotomies can be distinguished, but not separated. They are paradoxes -*apparent* opposites- which, in the final analysis, are the two sides of a coin, a unity-in-diversity, a Janus-faced reality[6]. One can argue that opposites must be 'balanced' or that they are 'complementary', but such statements are intellectual interpretations, while spiritual *experience* reveals the perfect non-duality of pairs of opposites. Wilber (section 8.4) argues that, inevitably, paradox is the way nonduality looks to the discursive intellect (see also footnote 23 in chapter 8; Gelderloos 1987:60). Only the infusion of a non-dual element (transcendental consciousness) can transcend dualities[7]. The dynamic tension of irresolvable paradoxes is resolved when a person is "graced with an inner breakthrough to a new vision" (Tarnas 1993:438)[8]. In the TM technique the dynamic interplay between 'withdrawal into oneself' and 'dynamic activity in the outside world' is emphasized. It is the regular alternation of these two poles which results in progress[9]. Spirituality is in this study defined as a process - it is learning the 'art of living' (Maharishi Mahesh Yogi 1968; Duintjer 1996). It is learning to deal with opposing polarities, which constitute the fabric of life.

6. With regard to the male-female polarity Howard-Borjas (1995) remarks: "Men and women are the two sides of a coin and one-sided coins simply do not exist". One can also say: 'les extrèmes se touchent'.

7. Tarnas (1993:409) speaks of "having to string the great Odyssean bow of opposites, and then send an arrow through a seemingly impossible multiplicity of targets". To my mind, the best arrow available is the enlivenment of transcendental consciousness in the mind. In the Indian *Bhagavad-Gita* Krishna reveals the secret of victory to the great archer Arjuna: *yogastah kuru karmani* - established in Yoga (Being), perform action. Yoga literally means 'union': the permanent, living coexistence of inner silence with outer activity (Maharishi Mahesh Yogi 1969:138; Douillard 1995:20).

8. Tarnas (1993) refers to Hegel, who speaks of the radical paradoxicalness of truth which can be transcended in a dialectical integration of opposites (thesis, antithesis, synthesis). "At the foundation of Hegel's thought was his understanding of dialectic, according to which all things unfold in a continuing evolutionary process whereby every state of being inevitably brings forth its opposite. The interaction between these opposites then generates a third stage in which the opposites are integrated -they are at once overcome and fulfilled- in a richer and higher synthesis, which in turn becomes the basis for another dialectical process of opposition and synthesis. ... The crucial word through which Hegel expressed his concept of dialectical integration was *aufheben*, meaning both 'to cancel' and 'to lift up'. In the moment of synthesis, the antithetical state is both preserved and transcended, negated and fulfilled. ... Hegel's overrriding impulse was to comprehend all dimensions of existence as dialectically integrated in one unitary whole. ... Whereas for most of the history of Western philosophy from Aristotle onward, the defining essence of opposites was that they were logically contradictory and mutually exclusive, for Hegel all opposites are logically necessary and mutually implicated elements in a larger truth. Truth is thus radically paradoxical. Yet for Hegel the human mind in its highest development was fully capable of comprehending such truth. ... While Kant had argued that reason could not penetrate the veil of phenomena to reach the ultimate reality, since man's finite reason inevitably became caught in contradiction whenever it attempted to do so, Hegel saw human reason as fundamentally an expression of a universal Spirit or Mind (*Geist*), through the power of which, as in love, all opposites could be transcended in a higher synthesis" (Tarnas 1993:379, 489). With regard to the intangible aspect of paradoxes, Tarnas says that the synthesis -transcending- of polarities leads to something beyond itself: "It brings an unexpected opening to a larger reality that cannot be grasped before it arrives, because this new reality is itself a creative act" (ibid.:445).

9. Maharishi Mahesh Yogi (1995:92) remarks that the coexistence of the opposite values of silence and dynamism creates "what we know to be consciousness. Consciousness is that element which is available in the coexistence of the opposite qualities of intelligence - one silence, one dynamism".

Table 13: Pairs of opposites

self-assertive	integrative	knowledge	wisdom
differentiation	integration	'thinking-being'	'being'
diversity	unity	dynamism	silence
analysis	synthesis	matter	spirit
reductionism	holism	body	mind
part	whole	natural sciences	social sciences
mechanistic	organistic	'hard' systems	'soft' systems
discrete, digital	analogue	order	chaos
depth - specialist	breadth - generalist	planning	serendipity
objective	subjective	top-down	bottom-up
object	subject	deterministic	free choice
dualistic	participative	structure	actor
relative	absolute	tradition	innovation
fact	value	stability	change
outside	inside	evolution	entropy
outward-oriented	inward-oriented	growth	decay
extravert	introvert	attachment	'letting go'
intellect	intuition	to become	to be
discursive-rational	intuitive	control-planning	laissez-faire
head	heart	discipline	freedom
abstract-conceptual	sensory-perceptual	private interest	public interest
reflection	experience	culture	nature
science	spirituality	anthropocentrism	ecocentrism
scepticism	open-mindedness	male	female
transcendent	immanent	uninvolved	caring
fragmentation	cohesion	antipathy	sympathy
formal	informal	taking	giving
quantity	quality	deconstruction	(re)construction
particular	universal	expansion	contraction
rigour	flexibility	individualization	globalization
authority	rebellion	blueprint	learning process
measurement	judgement	control	facilitate
standardization	differentiation	competition	co-operation
simplify	complicate	economy	ecology
human 'beings'	human 'doings'	struggle	joint agency
centralize	decentralize	complementary	non-dual
active	receptive	individual	organization
scientific	artistic	rational knowl.	experiential knowl.
explicit	implicit, tacit	sequential	simultaneous
west	east	local	global

11.2 The illusion of intellectual holism

The gap between FSR theory and practice -the dilemma to strike a balance between holistic views of farming systems and practicability of approaches- underlies the main research question in this study (sections 1.2 & 5.2). A key point in sustainable agriculture is the dynamic balance between ecology and economy. In contemporary society -characterized by reliance on free market forces- ecology threatens to come off worst. Ecology is often compromised, a synthesis of ecology and economy has not been achieved. With many pairs of opposites one tends to end up in compromises instead of syntheses. Since development processes are beyond full human control (section 9.1), I am afraid that only trying to *think* of opposites simultaneously will not do (section 11.1). 'Both-and' *thinking* might not result in 'the one thing as much as the other'. Since the field of transcendental consciousness embraces the two greatest opposites of all -evolution and entropy, order within chaos- regular access to this field seems important (Chopra 1993:171). Nature displays growth and decay -progression and regression- but is underlaid by the 'orchestrating' force of the field of creative intelligence.

The prevailing approach to FSR is an example of what I call 'the illusion of intellectual holism'. In my view it is an illusion to believe that complex interdependencies at high levels of integration can be grasped by intellectual reasoning alone. Even at the (intermediate) level of the farming system it is already difficult to gain a comprehensive view of the entire system. Holism in FSR is 'intangible' in the sense that it is incomprehensible, it is beyond the discursive intellect. One of the pioneers of systems thinking, Bertalanffy, speaks of 'a glorious unity of difference' (section 7.2). In this context I want to remark that computer technology and model building are not going to be sufficient to develop sustainable farming systems, since computers, in the end, are just extensions of our intellectual reasoning. It is an illusion to think that the interests of a multitude of stakeholders can be captured in models, and that politicians and planners would really use scenarios developed by scientists (section 10.2). Moreover, the problematic interaction between modelers and the target group of resource-poor farmers results in 'a silence of the users' (Vogelezang 1994) (section 2.5)[10]. In addition a broad supply of scenarios does not automatically imply public support for these plans. The notion 'to create public support' does not make much sense, since such support must be there right from the beginning (Van Woerkum & Aarts 1994). It has to emerge in the process of policymaking itself. 'To create public support' often boils down to having policy pushed down farmers' throats (ibid.). It is evident that many politicians protect only the interests of their grassroots support, and that they uphold the 'transfer to later and elsewhere' mechanism (Van Asseldonk 1984, Koningsveld 1987b). This may apply especially to those East African countries which are national states, but not (yet) nation-states (Eicher: Box 13 in section 5.1). The stage of political and institutional maturity of countries determines whether participatory policymaking is a realistic option[11]. Another issue with regard to modelling in Low Income Countries (LICs) is that in general the data base in LICs is poorly developed. Powerful computers and sophisticated models are handicapped without reliable input data: the 'garbage-in-garbage-out' principle cannot be circumvented. Moreover, the input data and outcomes of models need to be tested in the field; in the tropics with its enormous ecological and socio-economic diversity this can take years (Waaijenberg 1994b)[12].

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10. With regard to the conference 'The future of the land' (held at Wageningen Agricultural University in August 1993) Waaijenberg (1994a) remarks: "The fact that a recent conference of Wageningen Agricultural University was called "the future of the land" instead of "the future of the farmer" illustrates a major change in the orientation of this university" (This is one of the propositions which Waaijenberg presented with his thesis).

11. When countries are politically and institutionally 'immature' -i.e., when politicians are mainly guided by ethnic motives- participatory policymaking may reinforce the tendency of politicians to protect only the interests of their grassroots support. A 'strong' national government may be indispensable in such cases.

12. Schumacher (1989:248) remarks that the uncritical use of computers can lead to "the errors of spurious verisimilitude and spurious detailing - the two greatest vices of the statistician". Computer models carry

With regard to the impact of economists on policymaking, Meehan (1982) argues in his book 'Economics and policymaking: the tragic illusion' that most economic work does not relate to reality. Also in modern *agricultural* economics a great deal of abstraction of real conditions and problems takes place (Silvis 1994a:207). If agricultural economics wants to make meaningful contributions to policymaking, it will have to develop instruments with which rural processes can be guided in a sustainable direction. It must provide empirical information with which 'reasoned normative choices' can be made. Says Silvis (ibid.): "The knowledge required to comprehensively deal with these policy issues is overwhelming. ... Due to the dynamics and complexity of society, it is a very difficult task to provide such information, but not an impossible one". Scientists should not escape from reality and flee into abstractions, but admit the complexity of the task ahead, and remain modest with regard to their knowledge claims (ibid.:1994b). Generally speaking, the practice of policymaking is not directed by scientific theories. Policymakers usually take no notice of what scientists report (ibid.) (see also section 10.2). These observations from Silvis indicate, in my view, that reliance on discursive thinking alone might be a painfully slow approach to the development of sustainable farming systems. According to Silvis (1994a:208) agricultural scientists (including classical agricultural economists) highlight the 'workability' test: only that which works is 'true'. In pragmatic approaches the key question is whether knowledge claims can solve problems[13]. In the *experimental* approach, as advocated by the TM movement, the 'workability' test is indeed central. Scientific research indicates that the TM technique facilitates problem solving at the individual and collective levels (chapter 9). More attention of scientists for systematic and empirical investigation of techniques for consciousness development -in order to select the most effective and efficient ones- seems desirable.

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conviction through their very precision and credibility, but "the whole edifice, as is often the case, stands and falls with one single, unverifiable assumption" (ibid.:249). Forecasts presented, as it were, on the back of an envelope give "a much better chance of appreciating their tenuous character" (ibid.). One cannot plan sensibly "without doing a certain amount of forecasting. This is quite straightforward as long as that which has to be forecast is, in fact, 'forecastable', if it relates either to matters into which human freedom does not enter, or to the routine actions of a very large number of individuals, or to the established plans of other people wielding power. Unfortunately, the matters to be forecast very often belong to none of these categories but are dependent on the individual decisions of single persons or small groups of persons. In such cases forecasts are little more than 'inspired guesses', and no degree of improvement in forecasting technique can help" (ibid.). Röling (1994a) argues that economics can be integrated in Interactive Multiple Goal Planning Models "to the extent that economics can fit human action into predictive formulae" (section 1.4).

13. According to Silvis (1994a:21) pragmatism acknowledges the important role of rationalism and empiricism, but rejects the idea of a basic foundation which can offer certainty. Fundamentalism is replaced with fallibilism: all knowledge is in principle fallible. In Table 8 I have characterized the transcendentalist paradigm as a paradoxical paradigm, because transcendentalists claim that a universal and relative reality co-exist. All knowledge about these worlds is in principle fallible: only the universal reality itself and its direct experience are universal and extrahistorical (the *descriptions* of such experiences, expressed in -unavoidably- paradoxical statements about this universal world, are in principle fallible) (section 8.4). Although in the perspective of the transcendentalist paradigm the field of transcendental consciousness is the foundation on which creation rests, intellectual knowledge of this foundation cannot offer certainty. Regular (preferably permanent) direct experience of this field, however, guides our thoughts and actions in a societally and environmentally friendly direction. Nevertheless, the outcomes of our thoughts and actions are 'emergent properties' and thus in principle unpredictable. We just have to contact the field: - *how* the field 'organizes' the outcomes is beyond the comprehension of our intellect (this refers again to the illusion of intellectual holism). With regard to 'fundamentalism' I want to repeat that transcendentalists cannot fall into the trap of 'intellectual authoritarianism' as long as they directly experience the free, anarchistic spirituality which is the main characteristic of the transcendentalist paradigm (section 10.1).

The persistent problems in the Western agricultural system indicate that something is fundamentally wrong (sections 6.3 & 7.3). The rationalization of nature has resulted in irrationality (Koningsveld 1986b). Apparently 'logic does not preclude absurdity' (Fromm 1968). These persistent problems make that one can speak of an identity-crisis in agricultural science (Koningsveld 1987b). Scientific rationality met its own boundaries, and scientific rationality and societal rationality do no longer coincide (Lijmbach & Gremmen 1991) (section 8.3). The reductionist agricultural science is from a methodological point of view at a dead loss what to do (Koningsveld 1986b). The specialization in the agricultural sciences had as a consequence that agriculture as a whole disappeared from sight (ibid.). The key question is now how to obtain insight in the whole, and in the relation of the whole with its parts (see section 11.3). One can argue that negative 'externalities' -the unwanted side effects of productivity growth- are, in fact, 'internalities' in proper systems thinking (Beets 1990:68). Most agricultural scientists in LICs work within the Western agricultural scientific paradigm (section 6.3), which creates the danger that these countries, sooner or later, will face similar problems as the Western world does today. Western and non-Western scientists need to acquire a new 'Leitbild' in order to slow down the 'invisible hand' of technology-propelled development with its unwanted side-effects (Röling 1988:205, 206). Technology development, however, is an 'autonomous' process insofar and as long as people tolerate this (section 8.3). The seemingly 'automatic' process will no longer be a self-fulfilling prophecy when the actors involved *decide* to guide research, and other necessary activities, in a certain direction. The problem is that the multitude of actors, inevitably, have differing interests, and reconciliation of these interests proves to be difficult. Synergy can only emerge when the actors *decide* to work together 'as if they were one system' (section 10.3). With reference to Dippel, Van Dijk (1997) argues that every culture has the technology it deserves. In the perspective of the transcendentalist paradigm so-called 'inevitable' technological development -set in motion by the 'scientific imperative'- is a fabrication, which people can undo through a 'higher quality' collective consciousness (section 9.2). The quality of our technology is a reflection of the quality of our collective consciousness.

The Dutch agro-industrial system is one of the most 'research trodden' agricultural systems of the world. It is a scientifically 'rationalized' sector: in a process of homogenization, standardization and formalization change has been implemented at the technological, structural, and organizational level according to a logic of profit and power (Benvenuti 1994). Reductionist science and its products tend to operate as "steam rollers over local farm styles/epistemologies; and it takes deliberately pursued craftsmanship to resist such an influence" (ibid.). In spite of this steam-roller effect of the dominant positivist paradigm, the 'styles of farming' research program of Van der Ploeg et al. (e.g., Van der Ploeg 1991,1994) shows that individual craftsmanship is capable of defeating 'would-be technological determinism' (Benvenuti 1994)[14] (section 3.4). This points to individual actors' space for manoeuvre, and the primacy of actors over 'structures' (section 3.4). Koningsveld (1986a) argues that guidance of the socio-technical agricultural system in a certain direction requires

14. With regard to the 'theoretical' nature of his deliberations, Benvenuti (1994) says: "...long experience shows me that the fear of applied scientists to engage in 'abstract', 'theoretical' (or worse: 'philosophical') problems often renders them unexpected -unknowing but not innocent- collaborators of the social forces (that they see) oppressing or curtailing those in whose favor they believe themselves to be operating. The various western institutions for International Cooperation actually thrive on this sort of 'halved' scientist". Röling et al. (1997) remark: "John Maynard Keynes once observed that people who claim to be practical and not in need of theory usually turn out to be using the theories of yesteryear".

insight in processes of motivation and identity of the actors involved. Some insight in the way actors develop motivation for acting, and how this acting confirms and expands their identity, has been provided in Diagram 5 in chapter 3 (see also section 8.2; footnotes 7 & 9 in chapter 8). Farmers can distinguish themselves from others, and reaffirm their sense of personal identity, by adopting certain 'styles of farming'. This study suggests that farmers with a 'high quality' consciousness will more likely opt for those 'styles of farming' that are environmentally and societally friendly. The need to maintain a 'derived sense of identity' -an ego derived from the outer world- will decrease as a greater awareness of the 'true self within' emerges (section 8.2) (footnote 7 in this chapter). In my view access to the field of transcendental consciousness -in combination with relevant knowledge and practical skills- can guide farming in a more ecological direction. While conventional farming tends to focus on the 'curing' of symptoms -on 'end-of-the-pipe' solutions- ecological farming focuses on preventing problems, on causes of problems (Groen 1995:13). Also the transcendentalist paradigm claims to focus on an underlying cause of many problems, i.e., lack of access to the field of transcendental consciousness. An important principle in ecological farming is 'let nature work for you' (Fukuoka1978). This corresponds with the transcendentalist principle 'support of Nature' (section 10.5; footnote 8 in chapter 10)[15].

The move to more sustainable farming practices is not easy, it consists of a complex learning process that is calibrated by discontinuities, fraught with uncertainty, and characterized by complex system management (Röling 1994a). Farmers, however, experience this intensive learning process as exciting since "their new-found expertise and management control are a source of pride and self-confidence" (ibid.). Experience suggests that farmer learning and experimenting groups are the best option towards more sustainable practices[16]. Practical experience with platform processes -in which a multitude of stakeholders, not only farmers, negotiate about common property resources- is still limited, but exciting work is going on[17]. In my home area in The Netherlands, for example, a nature reserve ('De Peel') is under threat from surrounding intensive bioindustry[18]. Wagemans & Boerma (1998) speak of a 'context of creativity' to break stalemates between the various stakeholders in this area. This reflects the complexity of the process. The main issue in common property resources (CPR) management is that individual activity must be in line with collective activity in order to ensure

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15. In this context one of the favorite expressions of Maharishi Mahesh Yogi is 'do less and accomplish more'. In his view the silent 'activity' of contacting the field of transcendental consciousness in meditation results in dynamic and effective activity during the rest of the day: activity which is supported by the managerial power of the field of creative intelligence. In the early seventies, when I was a left-wing student, friends often criticized me for spending time in meditation, while there was so much work to be done in the outside world. However, there is no reason why we cannot be mystics and militants at the same time (Curle 1972).

16. Examples (mentioned by Röling 1994a) are Dutch farmers learning about integrated arable farming in groups (Somers & Röling 1993), Australian farmers learning about sustainable catchment management in Landcare groups (Campbell 1992), and Indonesian farmers learning about integrated pest management in irrigated rice in Farmer Field Schools (Van de Fliert 1993).

17. Studies, mentioned by Röling et al. (1997), which focus on the learning of people to manage common property resources are: Keiter & Boyce 1991; McKean 1992; Toulmin 1993; Webler et al. 1995; Basnyat 1995; Glasbergen 1996; Nitsch 1996; Bolding 1996; Aarts & Van Woerkum 1996; Fisk et al. 1998; and Dangbegnon (1998).

18. My parents (ex-small-scale farmers who decided to quit the 'rat race' during a process of land consolidation in the mid seventies) complain that the rural area has become so monotonous. In these days of bioindustry the only crop to be seen is maize, because maize can tolerate large quantities of manure deposits produced by innumerable animals.

a sustainable use of the CPR as a whole. Ostrom (1992) speaks of ‘self-governance’, and Lewin (1996) of ‘super-organisms’ - groups of individual organisms that focus on co-operative behavior (see also Russell 1983). Strategic rationality -inspired by the Darwinist view on the struggle for survival- must be replaced by a more comprehensive rationality (Röling et al. 1997). In the perspective of the transcendentalist paradigm farmer learning groups, platform processes, ‘contexts of creativity’, ‘self-governance’, and ‘super organism-like behavior’ are facilitated by a ‘high quality’ collective consciousness.

In order to surpass the illusion of intellectual holism -to wake up from ‘the dream of reason’ (Dessaur 1984:336)- more attention for the consciousness factor seems desirable[19]. One can argue that the long list of paradoxes presented in Table 13 has its origin in a single cause, and therefore a ‘single’ solution emerges. “To narrow our problems down to a single cause is a breakthrough in and of itself” (Chopra 1991:214). In the Indian *Vedic* tradition this single cause is referred to as ‘the mistake of the intellect’. The intellect’s irresistible need to explore the outside world eventually took us so far into the diversity of creation that the source of creation -the field of transcendental consciousness- was lost sight of (ibid.). With regard to the basic duality object-subject or body-mind, for example, the intellect tends to ‘forget’ the underlying unity[20]. A holistic approach must be based on the acknowledgement that we live in a double-sided reality: the relative world of time-space (today and tomorrow, here and there: the world of dualities) and the universal world of undivided unity (Schilder 1996). Even the concept ‘opposites’ itself can only be known against the background of unity or wholeness. Since the discursive intellect belongs to the dualistic world, it cannot ‘look beyond’ it (ibid.). The continual identification with the rational-empirical consciousness, however, can be transcended. In order to be able to ‘live’ the divergent problems of life, it is necessary to restore the intellect to its proper place in the total balance of awareness. People can live both halves of life, the universal state of the Self (the field of transcendental consciousness) and the relative state of the self (the ego) (Chopra 1991: 215). The ‘single’ solution presented here is *a kind of key factor that underlies and facilitates other problem-solving techniques which remain indispensable*[21]. Since we ourselves slice reality up into innumerable pairs of opposites

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19. In the Philadelphia Museum of Art (Philadelphia, USA) one can see a painting of Goya with the title *El sueño de la razón produce monstruos* (The dream of reason produces monsters) (Dessaur 1984:336).

20. Gerding (1996) wonders whether it is a human shortcoming that we are not able to see something which is a unity as a unity. This refers to ‘the mistake of the intellect’.

21. I do not maintain that there are no other methods to facilitate the ‘living’ of divergent problems. Hardin (1993:270), for example, argues that dance performances can produce or maintain complementarity. In Kono culture in Sierra Leone the ideal form of dance generates a feeling of balance and harmony among participants. “...the ideal dance is one that envelops numerous individuals -singers, musicians, and participants- in an atmosphere that balances the interests of individuals striving for recognition with an ideology that emphasizes cooperation” (ibid.:167). Complementarity, as opposed to individual action or intention, is an important structural property in Kono life. Identity is established by coming to terms with the complementarities of pairs of contrasts (ibid.:270). In my view, dance performances generate ‘balance’ and ‘harmony’ through the establishment of a ‘high quality’ collective consciousness. The music, singing and dancing generate ‘vibrations’ that -through a field effect- result in the emergence of a harmonious atmosphere. In the Western world participants in rock & roll, or more recently ‘house’, parties report similar phenomena (see also footnote 20 in chapter 9). Although dance performances (and maybe other human activities) can generate a (temporarily) ‘high quality’ group consciousness, experience teaches that the impact of such performances is not strong enough to establish a thriving and ethical society. To my mind, more effective methods must be used to create a permanently ‘high quality’ collective consciousness.

(section 11.1), we can also undo this 'mistake of the intellect'. In the end, of course, there is nothing new under the sun, and we are just 'dis-covering' or 're-collecting' old truths[22].

11.3 Trans-disciplinarity

The critical task of a 'uni-versity' is, amongst other things, to develop insight in the cohesion of sciences (Aans 1991). Scientists need to reflect on the 'universitas', the cohesion, the unity-in-diversity of the sciences (Bruinsma 1986). The question which crops up immediately is what all scientific disciplines have in common. The obvious, yet often overlooked, answer is that all disciplines are known by a knower, a subject (Schulte 1978:68). The knower is the connection point, the condition, the pivot of all knowledge. The point of departure for the development of 'universitas' is, therefore, the scientist him/herself. Knowledge of the knower is the pivot of all aspects of knowledge (ibid.). Wilber (section 8.4) referred to a unity-in-diversity of the general knowledge quest: the mind of the scientist looks at various domains (matter, mind and spirit in Diagram 11). We have to distinguish between the knower, the process of knowing and the known. In the positivist and constructivist paradigms more and more information on objects of research is collected, and methodologies (processes of knowing) are improved. The information processor or knower, however, receives hardly any attention. The transcendentalist paradigm focuses on the consciousness of the knower. In this computerized 'information age' the emphasis is not really on information, but on information processors. Since information dates fast, it is the information processor who makes the difference (Swanson & Oates 1989:129). While during the waking state of consciousness the knower and the known are separate -connected by a process of knowing- the *knower*, the *known*, and the *process of knowing* become one in the experience of transcendental consciousness. It is a 'three-in-one' state, in which the duality between object and subject is transcended (ibid.). In this state awareness is aware of itself alone, spirit directly knows spirit (mode of knowing number 1 in Diagram 11).

The present approach to interdisciplinary studies focuses on common domains, on areas of overlap, between disciplines (Russell 1990:159). Only the interconnections at surface level are seen. The consequence is that students regard interdisciplinary studies as superficial and "as something of a light relief from the real business of in-depth study" (ibid.:158). Holism, however, is not just a matter of interdependencies and cross-connections, it is the underlying wholeness which matters most (Ransijn 1985b). A holistic approach must pay attention to this deeper dimension, to the common underlying basis which allows the various disciplines to be perceived as different aspects of a whole[23]. In addition to cross-connections between disciplines (inter-disciplinarity), the basic connection (trans-disciplinarity) requires attention. Trans-disciplinarity entails an integration of science and spirituality, an integration of scientific reflection and direct spiritual experience. Science and spirituality must be distinguished, but they do not have to be separated. Science studies the everyday, relative world characterized by differentiation, while spirituality focuses on the universal world characterized by integration (see also Table 12 in section 10.1). According to Schumacher (1989:99) all disciplines are connected with a centre: "they are like rays emanating from a sun".

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22. To re-collect or remember is in Dutch: 'her-inneren' - to internalize time and again in a process of 'withdrawal into oneself' (Weeda 1996).

23. In the word 'uni-versity' unity comes before diversity (Maharishi Mahesh Yogi 1995:113).

> "Education can help us only if it produces 'whole men'. The truly educated man is not a man who knows a bit of everything, not even the man who knows all the details of all subjects (if such a thing were possible): the 'whole man'...*will be truly in touch with the centre*" (ibid.:100).

Since we are suffering from a metaphysical disease, says Schumacher, the cure must also be metaphysical (ibid.:107). One can argue that (some of) the 'classical' agronomists operated in a *pre-disciplinary* mode: they had knowledge of a (relatively) limited number of disciplines. In the last few decades, however, specialization was the key word, and scientists became increasingly *disciplinary* oriented. Today the enormous quantity of information provided by a multitude of disciplines cannot be 'absorbed' by a single person. A regression to pre-disciplinary times is not possible. The only option is a progression to a *trans-disciplinary* mode of operation (sections 8.3 & 8.4). We must acknowledge the illusion of intellectual holism, we need more wisdom.

Boelens (1986) refers to philosophy as 'desire for wisdom' because it is not in the first place an academic accumulation of knowledge, but rather a becoming aware of the necessity to gain insight in the connection between divergent and seemingly contradictory phenomena[24]. If philosophy must provide insight in how to cope with divergent problems, then -in the line of argumentation pursued in this study- it needs to inform us on how to get access to transcendental consciousness. Philosophy of science should provide insight in the unity-in-diversity of the sciences and in trans-disciplinarity[25]. Wisdom can be defined as "the capacity to make judgments that when looked back upon will seem to have been wise" (Salk: in Chopra 1993:249). Wisdom, however, is unteachable, you can only grow into it. An Indian adage holds: "This is not the kind of knowledge you acquire but the kind you must become" (Chopra 1993:249). Wisdom is an attribute of the field of creative intelligence (Maharishi Mahesh Yogi 1969: 355). Philosophy, then, needs to become a 'science of being' and an 'art of living'[26]. In the previous chapters several concepts appeared that are related to 'wisdom': societal rationality, comprehensive rationality, holistic perception, integral development of the personality, self-actualization, and the 'living' of opposites. Wisdom refers to something which is beyond discursive thinking. Schumacher (1977:55) says that "we are now far too clever to be able to survive without wisdom". Strasser (1963:108) maintains that wisdom is a 'basic attitude' and that insight in the whole is only possible through profound contact with the 'Reality' that governs the whole (ibid.:109). Richards (1985:156) says that agricultural science is more a pursuit of 'knowledge' than of 'wisdom' - which shows up in the 'bookishness' of much agricultural education. Hildebrand (1981a) remarks that co-ordinators of multidisciplinary FSR teams must, in a sense, be "orchestra director[s] who must assure that everybody contributes to the tune but that, in the final product, all are in harmony". This analogy fits in with the concept 'a field of collective consciousness': all team members contribute -and tune in- to a group consciousness.

In FSR the centrality of the farmer is emphasized, a 'knower' who daily manages a multitude of aspects without elaborate planning or modeling tools. In order to be a competent farmer one needs craftsmanship and entrepreneurship, in short management qualities. These management

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24. Philosophy is 'wijs-begeerte' in Dutch.

25. In my opinion it is weird that one can obtain the degree of *doctor of philosophy* (Ph.D.) without ever having read a book about philosophy of science.

26. 'The Science of Being and Art of Living' is the title of a book by Maharishi Mahesh Yogi (Maharishi Mahesh Yogi 1968) (first published in 1963).

qualities have an objective and subjective aspect. The objective aspect entails issues such as agronomy, animal husbandry, economics, marketing, natural resource management, and so forth. The subjective aspect encompasses the consciousness and physiology of the manager. The transcendentalist paradigm emphasizes this subjective aspect. In the final analysis, it is not only farmers who make 'inappropriate' choices, but all of us (Fagan 1995:125). By creating a 'high quality' collective consciousness in society at large, and enhancing the quality of consciousness of farmers, the development of an environmentally and societally friendly agriculture can be facilitated. Although research on the use of the TM technique by farmers has not been done yet, the consistent results with a variety of other professional groups warrant a generalization to the group of farmers (ibid.:128). Scientific research indicates that the TM technique improves health, comprehension, intelligence, creativity, decision-making ability, job performance, job satisfaction, physiological relaxation, and quality of interpersonal interactions. For more detailed information on physiological, psychological and sociological effects I refer to MVU (1976-1995), Swanson & Oates (1989), Segaar et al. (1992), Fagan (1995) and Box 19 and 20 in chapter 9 (numerous references to publications in scientific journals can be found in these overviews). Meta-analyses showed that the effect of TM on reduction of anxiety and other measures of psychological distress was about twice as large as the effect of other relaxation or meditation techniques (Ferguson 1981, Eppley et al. 1989). Another meta-analysis indicated that the effect of TM on self-actualization was about three times as large as the effect of other techniques (Alexander et al. 1991). Although TM certainly is not the only technique that can enhance individual performance, it seems to be a relatively effective method[27]. In Box 22 I present the view of Fagan (1995) on modern medicine and health-education. This merits a full-length quotation, because the basic principles expounded by Fagan hold also for the field of agriculture. I have argued before that health, just as sustainability, is an integrative, holistic property (section 9.5).

Box 22: Modern medicine and health-education

Says Fagan (1995:61): "According to the U.S. Surgeon General, the majority of diseases is self-induced and as much as 80% of medical problems can be prevented through behavioral or lifestyle change". With regard to education and behavior modification, he remarks: "The basic problem with the preventive approaches now in use is that they work on a level that is too superficial. Educational programs such as *Live for Life Program* are not powerful enough to change the behavior patterns and environmental conditions that cause disease. If external pressure is the primary influence in modifying behavior, then the deeper problems that initially gave rise to that behavior will manifest in some other way, causing other problems [this refers to the upper route in Diagram 5 in chapter 3]. The pressures that cause people to smoke often induce other harmful behaviors -overeating for

27. I did not encounter publications on research work focusing on a *collective* effect (a field effect) of other meditation or relaxation techniques. I must admit, however, that I did not systematically search the scientific literature for such research findings. Nevertheless, if other techniques for consciousness development would have similar effects as the TM technique, then this would only strengthen the ideas brought forward in this study.
A study of the statistics of an American health insurance company (including about 2000 meditators and 700,000 non-meditators) showed that persons practising TM required much less medical care than control groups matched for age, gender, profession and insurance terms. Meditators required less than half as many doctor visits and days of hospitalization ($p < 0.0001$) (Orme-Johnson 1987). Another study (based on data from the government health insurance agency of the Province of Quebec, Canada) revealed that TM reduced health care utilization by 49 % by the end of the seventh year after beginning the practice. Each year after beginning TM, health care utilization dropped by 7 % (Herron et al. 1995). On the basis of these research findings, some insurance companies have reduced premiums for health insurances for people practising TM.

example- if individuals are deprived, or deprive themselves, of tobacco" (ibid.:65). "...for interventions to be successful, they need to work from a level much more fundamental than education or behavioral manipulation. The strategy of addressing risk factors one-by-one is a natural outgrowth of the objective, reductionistic scientific approach, upon which modern medicine relies" (ibid.:66). "Health is not a function of the properties of isolated components of the physiology, but rather of the balanced, integrated functioning of the whole. ... By attempting to deal with health piecemeal, medicine has been reduced to an unending exercise in correcting symptoms" (ibid.:73). "...health is an integrative, holistic property. ... ..medical practice must work at a level that is common to and integrates all aspects of the physiology" (ibid.:74). "When this body of research [on TM] is compared to that of any modern medical treatment or drug, one thing is strikingly absent: that is, the lack of negative side effects. In the over 4,000 pages of research papers compiled in *Scientific Research on the Transcendental Meditation and TM-Sidhi Program: Collected Papers Volumes 1-6*, it is notable that no harmful effects are observed. This confirms the point made earlier that these technologies, which work from the level of...the field of pure consciousness, create integrated beneficial effects -and no harmful side effects- in all aspects of the mind and body. ... By working at this fundamental level, it is possible to eliminate those imbalances that are the source of disease, instead of waiting for disease to manifest fully and then treating the symptoms" (ibid.:92). "The inadequacies of our medical system can ultimately be traced to the current status of collective consciousness. Because awareness has been restricted to surface levels, thinking has not been sufficiently comprehensive and coherent. ... Physicians...have focused on progressively more isolated values of the physiology in their attempts to preserve and restore health. The move to dangerous and destructive genetic therapies is the logical and most extreme outgrowth of this trend" (ibid.:95). "Knowledge generated through the current scientific paradigm unavoidably creates side effects. This same paradigm creates a style of thinking in which society is willing to accept the damage caused by side effects as the unavoidable price that we must pay for 'progress'. In the final analysis, using this approach by itself will only perpetuate the problem" (ibid.:17). We must give up 'dreams of magic bullet, high-tech approaches', and enhance our capacity to make wiser, more far-sighted decisions. The body's own healing powers can be enlivened by awakening the inner intelligence in our own consciousness (ibid.:99) [this refers to the lower route in Diagram 5].

To my mind the number of variables that are at play in agriculture make it difficult to grasp the complexities of farming systems at the intellectual level[28]. In the perspective of the transcendentalist paradigm the management of the 'simultaneous multiple interface interactions' among actors, and between actors and the natural environment (section 10.4), originates from the field of creative intelligence. Only the integration of physiological, psychological, sociological and ecological aspects can result in wholeness (MIU 1975). This is demonstrated in Diagram 14 which depicts 'a problem tree' as put forward by farmers from Zaka/Chivi Communal Lands in Zimbabwe (Hagmann 1993). Farmers in this area perceived social problems as more constraining than technical problems. 'Lack of cooperation' was ranked as a priority problem. Farmers defined their goal as 'a life in social harmony and in harmony with the environment', but generation conflicts and leadership crises resulted in general apathy (ibid.). While the younger and more educated part of the population attributed low rainfall to the destruction of trees, older people attributed it to the non-observance of traditional customs. These tensions, together with an increasing individualization, resulted in a vicious circle of discouragement, apathy and donor-dependency (ibid.). Hagmann (1993) argues that participatory approaches require development of self-confidence, a positive social atmosphere,

28. Maharishi Mahesh Yogi (MIU 1978:179) says: "Farming means creativity. Certainly on the surface level it appears to be the creativity of the land and of the farmer, because we see that all that beautiful food comes out of the mud, tilled by the farmer. But when we stop to consider, we realize: all that growth from mud! So what we want is to strengthen that hidden agency which, from some invisible hiding place, converts the mud into food. ... It is the creativity of the agency that governs all this growth which is our concern. ... ..when we talk of agriculture we are in fact talking of the creative intelligence of nature..". Two favorite expressions of Maharishi in this context are: 'water the root to enjoy the fruit' and 'as you sow, so shall you reap'.

appropriate attitudes of change agents, and targeting of farm-households as units. He concludes by saying: "As there is no alternative to self-reliance, all institutions and organizations involved in a certain area should apply the same approach, coordinated by one authority" (ibid.). This coordination among a multitude of organizations and individuals, however, is a major problem in rural development (*operational problem* 1: section 5.1). Many elements in the problem tree in Diagram 14 are related to a 'low quality' collective consciousness. A 'higher quality' collective consciousness (a positive social atmosphere in Hagmann's words) would facilitate the implementation of participatory approaches. The coordination of the knowledge, skills and means of numerous actors through the agency of the field of creative intelligence is depicted in Diagram 15. When the supposedly 'orchestrating' quality of this field is 'enlivened' in the minds of actors, then overall system performance would be enhanced. The managing capacities of actors, says Maharishi Mahesh Yogi (1995:92), must be in alliance with the managing intelligence of this field. In a 'symphonic agriculture' (Pierce & Swaminathan 1988) 'orchestration' of 'synergy in the mix' is facilitated by consciousness-mediated manageability (section 9.5).

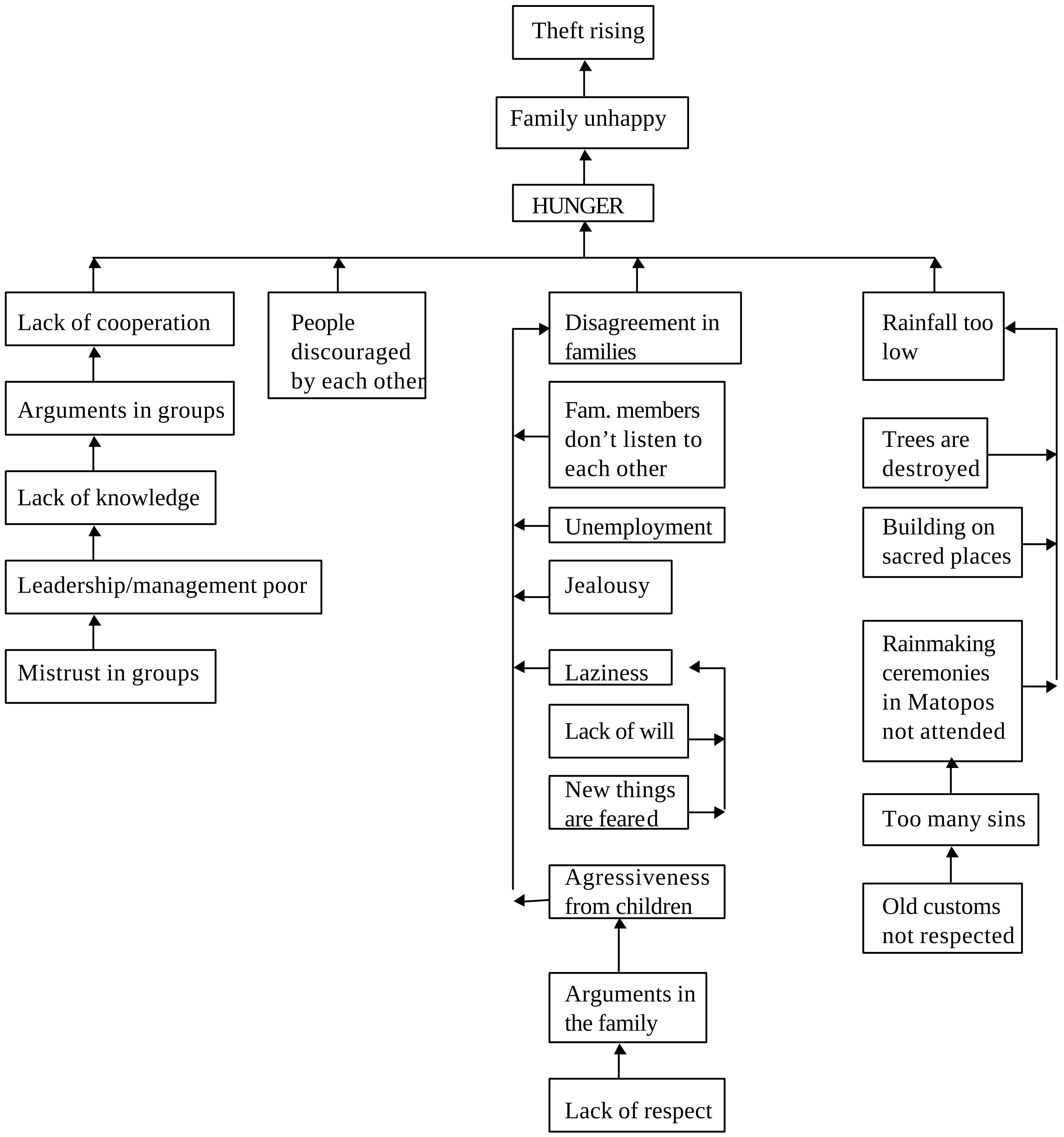


Diagram 14: Problem tree of socio-cultural issues as put forward by farmers from Zaka/Chivi Communal Lands, Zimbabwe (Hagmann 1993).

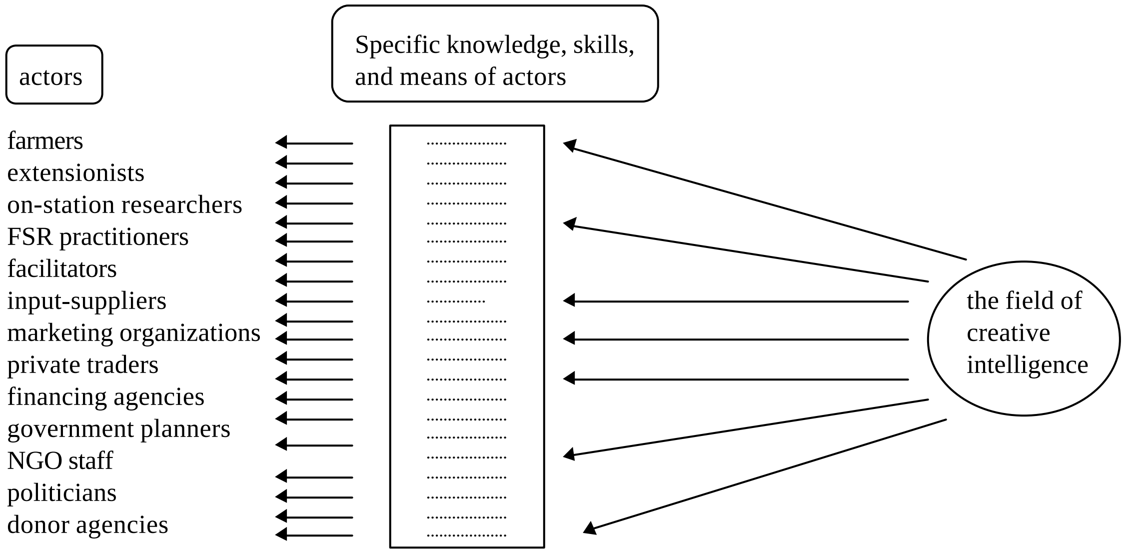
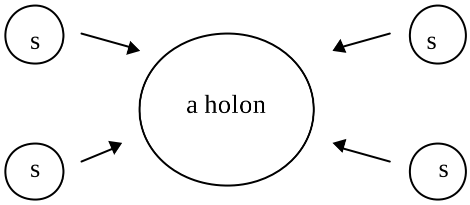


Diagram 15: The co-ordination of knowledge, skills and means of a multitude of actors in rural development by the field of creative intelligence (adapted from Maharishi Mahesh Yogi 1995:23).

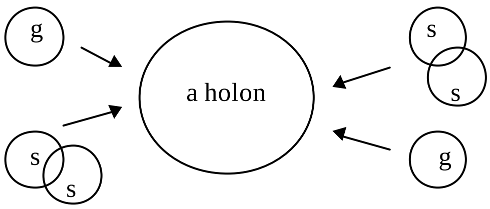
In the sections 7.2 and 9.6 I have argued that *in principle* interdisciplinarity in multidisciplinary FSR teams *can* emerge when there is synergetic interaction among team members, but that in most cases this does not materialize due to problems of operating as a true 'human system' (a dynamic equilibrium of self-assertive and integrative tendencies does not automatically emerge). Moreover, we have seen that *even* with interdisciplinary collaboration 'emergent properties' of holons can be overlooked when researchers *look from the outside* to farming systems. Only farmers can bring holism to research projects (*operational problem* 1: section 5.1). Only farm-household members command an outward-looking perspective: they look outward from the perspective of their farming system at available knowledge from various agricultural disciplines and other sources. In Diagram 16 I have tried to illustrate what, in my view, multi-disciplinarity, inter-disciplinarity, and trans-disciplinarity entail. Multi-disciplinarity entails that commodity- and discipline-oriented specialists, separately, study a farming system, while inter-disciplinarity means that specialists and generalists (trained in several disciplines) study a farming system (ideally) in close collaboration, but they, unavoidably, focus on areas of overlap between disciplines. Trans-disciplinarity entails that farm-household members, specialists, and generalists study a farming system from their respective points of view, while they maintain transcendental consciousness in their awareness. The outward-looking perspective of farm-household members and the (multi)disciplinary perspective of scientists are grounded in the field of creative intelligence. Although several authors (e.g., Heckhausen 1972, Van Oostrum & Peters 1995) speak of trans-disciplinarity, they do not refer to the consciousness factor. Trans-disciplinarity is seen as a meta-theory, or an overarching paradigm, but the practicability of such encompassing concepts remains problematic, due to the fact that trans-disciplinary 'modes of inquiry' are not mentioned (section 9.5).

Multi-disciplinarity



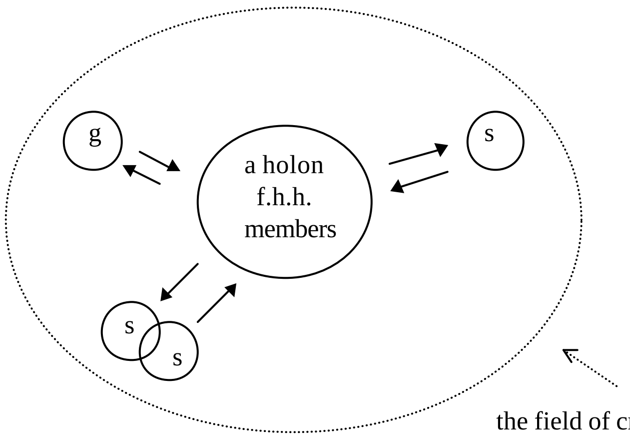
Commodity- and discipline-oriented specialists (s) study a holon, in this case a farming system.

Inter-disciplinarity



Specialists and generalists, trained in several disciplines (g), study a holon, but focus on areas of overlap between disciplines.

Trans-disciplinarity



the field of creative intelligence,
the field of transcendental consciousness,
the transcendent and immanent aspect of
spirituality

Farm-household members (f.h.h.) manage their holon by looking outwardly from the perspective of the farming system at available information from various disciplines and sources. The outward-looking perspective of f.h.h. members, and the (multi)disciplinary perspective of specialists and generalists, are grounded in the field of creative intelligence. All actors maintain transcendental consciousness in their awareness while being engaged in specific activities.

Diagram 16: Multi-, inter- and trans-disciplinarity
(adapted from Savory 1991)

One can say that the laws elucidated by modern science are *localized expressions* of the field of creative intelligence. According to Fagan (1995:134) use of these specific localized laws by specialists and generalists will be guided in an environmentally and societally friendly direction when scientists have access to this field. In holistic management parts must always be managed with reference to the whole[29]. In this context the concept 'field-independence' is important: it refers to the ability of individuals to maintain broad comprehension while focusing sharply on a specific area. There is some evidence that the TM technique enhances this ability (Pelletier 1974). FSR practitioners must maintain a farming systems perspective while working within single subsystems. Enhanced 'field-independence' would facilitate this crucial issue in FSR work.

In addition to more interdisciplinarity between the various disciplines within the field of science, a trans-disciplinarity that encompasses science and spirituality seems needed. This unity-in-diversity of the knowledge quest is expressed in the Janus-face. All three components -*farming*, *spirituality* and *research*- demand attention in the development of sustainable farming systems. *Farming* refers to the centrality of farm-household members, as exemplified in participatory approaches, and to the importance of relevant knowledge and practical skills. *Research* refers to high quality, client-oriented on-station and on-farm research, and *spirituality* points to the 'orchestrating' agency of the field of creative intelligence. The trans-disciplinarity as depicted in Diagram 16 encompasses these three components. Farming systems are holons that can be studied by 'objective' and 'subjective' approaches. The Janus-face does not only look downward and upward (to smaller and larger holons), but also inward and outward (combining 'subjective' and 'objective' approaches in a holistic method). As a symbol of non-duality it exemplifies that research and spirituality can be simultaneously employed to create sustainable farming systems.

11.4 Internalization and transformation processes

In this section I will return to the main issue 'attitudinal factors' (which was already touched upon in chapter 10, but can be further clarified). Van Eijnatten (1983) emphasizes in a paper on agricultural research and extension in the Coast Province in Kenya the need for a change in attitude with extensionists and researchers. He concludes that "..with very little adaption within the existing structure coupled with a major change of heart from the side of staff members of the extension and the research services, the operation of the structure can be greatly enhanced" (ibid.:55). Here the primacy of individual attitudes over structures is emphasized. Nickel (1989:22) mentions the following components of a value system appropriate to an agricultural research institution: concern for the welfare of the rural and urban poor, a strong client orientation, a commitment to excellence or high standards of performance, a commitment to relevance of research, a sense of urgency, mutual respect and trust among all levels of employees, and cost consciousness. The question is how to install these core values in staff members, so that they become second-nature to every employee.

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29. Savory (1991:33), referring to Heinrich von Kleist, gives the example of a puppeteer who handles a marionette by moving its center of gravity. Natural gestures of a marionette cannot be produced by pulling a large number of individual strings, the result would look mechanical, robot-like. The simple and elegant solution is to move the center of gravity, which brings about all other gestures automatically. In our case the 'center of gravity' to be 'moved' or 'enlivened' is the field of creative intelligence.

Based on a study of the agricultural research systems of nine countries, Merrill Sands & McAllister (1988:xxiii) concluded that 'a shared sense of mission' was the most difficult condition to realize. In the context of more participatory approaches to research and extension attitudes are paramount. Moreover, a change in attitude is also required with respect to the 'modern agriculture syndrome' - the continuing focus on high-external-input agriculture (sections 4.1, 4.2 & 4.3)[30].

With regard to the 'internalization' process it is evident that *information* offered from the outside is not immediately used: first it has to be processed and transformed into *knowledge* and, subsequently, into changes in attitudes and behavior. There is a time-lag: external information follows a detour, or roundabout way, of internalization before it is transformed into actual behavior (the arrows number 1 and 2 in Diagram 5 in chapter 3). Röling (1988:33) speaks of the confusion in terminology in the use of the words *information* and *knowledge*. Knowledge and information are intrinsically related concepts but they have to be distinguished for analytical purposes. Engel (1995:38) says:

> "*Knowledge* is taken very broadly as the concepts, ideas, insights and (mental) routines people use to impute meaning to events and ideas. Knowledge is implicit in individual and social actions. *Information*, on the contrary, is taken as explicit. It is defined as a pattern imposed on a carrier such as sound, radio waves, paper, diskettes, electronic cables and others. These patterns are intended by some people for people to understand and attribute meaning to. ... This creates what is referred to as the information paradox. Although, generally speaking, social actors who produce information do so to express a particular meaning, they are never sure whether the intended beneficiaries will attach exactly that same significance to it".

In the view of Leeuwis (1993:56) the distinction between information and knowledge is largely obsolete, because "information has no meaning if it cannot be internalized, and by being internalized, it becomes part of a stock of knowledge". Hamilton (1995:37) remarks that "people's knowledge shapes the information they receive, so for the same piece of information, different people will assign different meanings and arrive at different knowledge". Vicari et al. (1996) argue that knowledge refers to information inside the cognitive system as opposed to data outside the system, and that, therefore, knowledge is not directly transferable. Bos (1974), finally, maintains that cognition- and choice-processes are searching processes, heuristic and iterative in nature (section 1.2: Diagram 1). To my mind internalization and transformation processes are indeed best understood as heuristic processes of rhythm. Intellectual insight in 'the continuously adapting play between poles' (facts and thoughts, goals and routes, insights and decisions, words and deeds) is, in my view, difficult to obtain. These rhythmic processes must be 'lived'. The distinction between information and knowledge may be difficult to maintain in fast moving, rhythmic processes. Also the transformation of knowledge into attitudes and behavior is probably beyond the domain of the discursive intellect (I have said in section 3.2 that Diagram 5 is an attempt to an ideal-typical model for analytical purposes only). Internalization and transformation are a kind of 'black box' processes[31].

30. Beets (1990:602) says: "In most of the Tropics, formal education has, over the years, become the 'panacea of the masses', particularly in Africa. But education generally has a built-in Western urban bias... .. Social structures and education systems have tended to give graduates a superiority complex and an aversion from, and inability to deal with down-to-earth problems and working in the field. Since there is invariably a shortage of practical training in the education establishments, graduates are also not able to understand real-life field situations".

31. I speak of *internalization* and *transformation* processes, because external information can be *internalized* into personal knowledge, but this personal knowledge cannot be internalized (it is already internal) but must be

Nevertheless, these processes do take place, and attempts to accelerate and/or partially circumvent them deserve our attention.

Knowledge is the outcome of “lifelong information processing, storage and retrieval going on in the neurophysiological system” (Röling 1988:186). One can argue then that the formation of knowledge is dependent on the ‘condition’ or ‘alertness’ of this system. We all know that the ‘brightness’ of our mind and the degree of being ‘stressed’ affect the processing of information: when we are sleepy, dull, or tired the processing of information into knowledge does not function optimally (section 9.2). Scientific research suggests that the alertness of the neurophysiological system is a function of the degree of access to the field of transcendental consciousness[32]. It would be interesting to know, for example, why some persons transform anti-smoking information into knowledge and subsequently decide to stop smoking, while others -despite numerous extension campaigns- continue to smoke. In addition to social group control (identification) and being ‘told’ by authorities (doctors, teachers, parents) what to do and what not (compliance), other factors might play a role. Van Eijk (N) (1986:105) argues that through enlivenment of transcendental consciousness health-supportive behavior develops, as it were, ‘spontaneously’. Health-supportive behavior develops based on the mind-body’s own intelligence: a problem-solving ability develops from ‘within’ (see also Box 22 in section 11.3)[33]. An enlivenment of transcendental consciousness might facilitate (accelerate and/or partially circumvent) the roundabout process of internalization (the arrows number 1 and 2 in Diagram 5). There is absolutely no danger of ‘we-know-best-for-you social engineering’ because spirituality cannot be forced. Says Wilber (1985a:291): “There are only *participants* in emancipation. You can only force slavery; you cannot force a person to be free”. Cernea (1991) maintains that the fundamental calling of social sciences is “not only to analyze and explain, but also to assist in transforming society and improving people’s lives”. Imperfect knowledge on the many factors that influence transformation of society is unavoidable (the illusion of intellectual holism), but, nevertheless, facilitation of collective agency and concerted action is possible.

The transcendentalist paradigm is an extension of earlier paradigms, and verification in communities of objective, inter-subjective and trans-subjective ‘peers’ is emphasized (see the criterion methodology in Table 8 in chapter 6). This paradigm is defensible or justifiable in three

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transformed into actual behavior. In this context I wonder whether computer-based modelling exercises by students and scientistst result in transformation of knowledge into client-oriented attitudes and behavior. Modelling exercises generate a lot of data and information, which the modellers themselves might have internalized into personal knowledge, but this knowledge is not transferable to the target group (and the target group of resource-poor farmers cannot interact with the model due to its sophistication and the preference of farmers for hands-on learning). In my view, field experience -in the sense of direct contact with farmers- is the first requirement for agricultural scientists, eventually complemented with computer-based learning, not the other way around.

32. I must repeat here that the assumption is that we measure with scientific instrumentarium the *effects* of regular access to *transcendental consciousness*. Brain wave research on meditators can result in characteristic EEG patterns, which might be linked to, for example, enhanced creativity (section 9.4), but this does not prove a causal relationship between creativity and access to transcendental consciousness (see also footnote 7 in chapter 9). Nevertheless, scientists routinely make informed deductions from such correlations. The internally consistent transcendentalist paradigm supports such deductions.

33. Scientific research indicates that people who start with the TM technique spontaneously reduce the use of cigarettes (Benson & Wallace 1972, Ottens 1975). The introduction to the TM technique entails no prescriptions for a specific life style. People spontaneously reduce the intake of cigarettes, alcohol, marijuana, etc.

different modes: 1) the direct *effects* of, presumably, access to the field of transcendental consciousness on, for example, physiological health can be verified by methodologies as used in the natural sciences; 2) the indirect field *effect* of a 'high quality' collective consciousness on a multitude of indices of quality of life can be verified by social science methodologies (see Box 20 in chapter 9); and 3) the *field* of transcendental consciousness *itself* can be verified in a community of 'peers' - i.e., persons who are willing to learn and practise techniques for consciousness development. The transcendentalist paradigm provides leads for further testing. The practical methodology that I propose to be used in the testing of this paradigm -the TM technique- is an experimental methodology that is suitable for scientific experimentation since it can be easily learnt by (almost) anybody. In the next box I give some examples of hypotheses that are *provisional but testable*: the predictions made can be subjected to scientific investigation.

Box 23: Testable hypotheses on the effects of a technique for consciousness development

A first option would be to select two similar villages in a certain area, and teach the population of one village the TM technique while the other village is not introduced to this technique. The introduction of the TM technique is the only intervention that takes place, no prescriptions whatsoever for changes in life style are given. A certain number of farm-households in the 'TM village' can be compared with a control group in the other village, matched for characteristics such as pre-test income level, area cultivated, family composition, level of education, and so forth. Quality of life indices such as physiological and psychological health, income levels, yield levels, crime rate, etc., are measured before the introduction of the TM technique, and afterwards at specified time intervals (for example, 6, 12 and 24 months after the intervention started). The hypothesis is that the TM-practising group will score significantly better on the quality of life indices than the control group. It is advisable to discuss the set-up of such an experiment right from the beginning with an experienced biometrician in order to avoid any flaws in statistical lay-out and analysis. The (methodological and statistical) procedures to be followed should be agreed upon before the start of the experiment. It might be difficult to convince an entire village to start with the TM technique, and continue to practise it for a specific period of time. As long as the group of meditators is sufficiently large (to allow for statistical testing), there is no problem. A second hypothesis is that when the group of meditators constitute more than one percent of the population in the village, also the non-meditators in the 'TM village' will significantly improve in quality of life indices, as compared to the control village. The non-meditators in the 'TM village', however, will make less progress than the meditating group.

A second option which tests the field effect of consciousness would be to place a small group of people, who twice daily participate in the group practice of the TM-Sidhi program, in a certain area for a specific period of time (the group size should be at least the square root of one percent of the population in that area; in an area with 1000 families with an average family size of 5, this would amount to a group of 8 persons). This group of 'advanced' meditators should not interfere in any way with the life of the target group, the only thing they do is meditate twice per day in that area. The pre-intervention quality of life indices, those ones during the presence of the group, and the ones after the group has left, are compared to one another. The prediction is that during the presence of the group the quality of life indices will significantly improve, and after the departure of the group will decrease again. Procedures of collecting and analyzing quality of life indices must be agreed upon before the start of the experiment (statistical experts to be consulted in advance).

A third option would be to measure whether the rate of adoption of a certain environmentally and societally friendly innovation, introduced in a specific area, is influenced by the practice of the TM technique. The hypothesis is that with a 'high quality' collective consciousness (i.e., at least one percent of the population meditating) the adoption of such an innovation will proceed at a wider scale and higher speed: more farmers will adopt faster. The enhanced overall performance of meditating farmers, and their field effect on non-meditating farmers, will result in 'spontaneous' adoption of such innovations. Hamilton (1995: 151) argues that diffusion still works, but is inefficient, and wonders what the nature of adoption under diffusion processes is. In my view 'automatic' diffusion occurs with a 'high quality' collective consciousness.

The ratio of 'converted' (in the sense of having a participatory attitude) scientists, extensionists and facilitators to resource-poor farmers will always be small (section 5.1: *operational problem* 8). The field effect of consciousness could make that relatively small numbers of change agents have great impact. Moreover, farmers have the tendency to learn from colleague farmers rather than from change agents. This underscores the importance of 'spontaneous' farmer-to-farmer diffusion facilitated by the agency of consciousness. In this exploratory study I did not endeavor to test plausible hypotheses (plausible from the point of view of the dominant scientific paradigm), but rather to develop new testable ones (Röling et al. 1997). A *scientific* theory must stick its neck out, must be able to collide with the facts (Koningsveld 1995). The theory formulated in this study gives rise to predictions that can be tested, and is thus scientific. In a process of 'trial and error' -'conjecture and refutation' in Popper's terminology- we can select the best of in principle fallible theories, and preliminary accept it. The transcendentalist paradigm can explain phenomena which in earlier paradigms cannot be resolved (for example, the field effect of consciousness, and the fact that people differ in their ability to operate intuitively, the topic of the next chapter).

11.5 Conclusion

Life is a succession of divergent problems, of opposing polarities which constitute the fabric of life. Since we ourselves slice reality up into innumerable pairs of opposites, we can also undo this 'mistake of the intellect'. Spirituality can help us to transcend and 'live' these polarities. The co-existence of apparent opposites (paradoxes) results in wholeness and holistic performance. A synthesis of self-assertive and integrative tendencies in FSR teams is an example of a divergent problem that has been transcended. In such FSR teams the whole is more than the sum of the parts. A holistic approach must be based on the acknowledgement -and the direct experience- that we live in a double-sided reality: the relative world of time-space and dualities, and the universal world of undivided unity. The discursive intellect belongs to the relative world, and cannot 'look beyond' it. The holistic aspect of farming systems -their irreducible integrity- is 'intangible' in the sense that it is incomprehensible: it is beyond the discursive intellect. The number of variables that are at play in agriculture make it difficult to grasp the complexities of farming systems at the intellectual level. Conventional FSR suffers from the 'illusion of intellectual holism'. Also farming systems are holons characterized by self-assertive and integrative tendencies.

The point of departure for the development of 'universitas' ('unity-in-diversity' of the sciences) is the scientist, the consciousness of the knower. In addition to cross-connections and overlap between disciplines (inter-disciplinarity), the basic connection -the underlying wholeness- requires attention (trans-disciplinarity). Since regression to pre-disciplinary modes of operation is impossible, the only option is progression to trans-disciplinary operation. Interdisciplinarity is difficult to establish, but even then 'emergent properties' of holons can be overlooked when researchers look from the outside to farming systems. Trans-disciplinarity entails that farm-household members, specialists, and generalists study farming systems from their respective points of view, while they maintain transcendental consciousness in their awareness. In a 'symphonic' agriculture the 'orchestration of synergy in the mix' is facilitated by consciousness-mediated manageability. Trans-disciplinarity entails an integration of scientific reflection and spiritual experience.

With regard to the main issue, ‘attitudinal factors’, the ‘black box’ processes of internalization and transformation are important. Information must be internalized into personal knowledge, which, in turn, must be transformed into changes in attitudes and behavior. An enlivenment of transcendental consciousness might facilitate (accelerate and/or partially circumvent) the roundabout process of internalization (the arrows number 1 and 2 in Diagram 5 in chapter 3). Although research on the use of the TM technique by farmers has not been done yet, the consistent results with other actors warrant a generalization to the group of farmers. The theory formulated in this study gives rise to predictions that can be tested, and is thus scientific. Some examples of *provisional but testable* hypotheses are given in Box 23. So-called ‘autonomous’ technology development is a fabrication that people can undo through a ‘higher quality’ collective consciousness. What we need is more wisdom.

The conclusion of this chapter is that we learned more about F, M and A (Diagram 2 in chapter 1). The framework of ideas and concepts underlying FSR (F) has been further clarified: the concepts ‘illusion of intellectual holism’ and ‘universitas’ have been introduced. Methodologies (M) to overcome this illusion and to establish ‘universitas’ have been indicated: transcending pairs of opposites, and trans-disciplinarity. With regard to the multitude of actors in the field of rural development (A) we have learnt that ‘orchestration of synergy’ is facilitated by access to the field of creative intelligence. The main issues ‘interdisciplinarity’, ‘attitudinal factors’ and ‘holism’ have been further elucidated in this chapter.

The main research question in this study is ‘why is it so difficult to improve the ability of FSR teams to develop sustainable farming systems’. At first sight the answer on this question is that a long list of operational problems hampers the implementation of FSR theory. Most FSR practitioners believe that the fundamental problem does not lie with the principles of the FSR approach, but with its implementation (section 5.2). To my mind, however, the operational problems stem from two erroneous theoretical assumptions. FSR theory is based on (1) the assumption that a holistic approach can be implemented at the level of the rational-empirical consciousness, and (2) in the positivist and constructivist paradigms, which underlie this theory and which are grounded in a continuous identification with this consciousness, the assumption is that other ‘modes of being’ are not possible. The many operational problems have been centered around four main issues -holism, interdisciplinarity, attitudinal factors, and lack of countervailing power- which, at this point in the study, all have been clarified from the perspective of the transcendentalist paradigm. I have approached the research question from the perspective of these four main issues, and -time after time- the consciousness factor surfaced as an important element. The answer on the ‘why’ question is that FSR teams (and other actors in the process of rural development) are ‘trapped’ in the habitual, and therefore largely unnoticed, identification with the rational-empirical consciousness. The logical answer on the ‘how’ question (section 1.2) is then that the ability of FSR teams to develop sustainable farming systems can be enhanced by ‘a psychological flip’ out of this consciousness. This does not imply that the discursive intellect must be abandoned, but rather that the *single* reliance on intellectual reasoning, unnecessarily, limits our capacity to find adequate solutions to persistent problems. The dominant positivist paradigm, as well as the emerging constructivist paradigm, need to be complemented with the transcendentalist paradigm. Intellectual understanding *and* internalization of this paradigm (by engagement in its practical methodology) can enhance the ability of FSR teams (and other stakeholders) to develop sustainable farming systems. In that way the gap between FSR theory and practice can be closed.

Although the main research question has been answered now, one last issue remains to be discussed. In previous chapters the concept 'intuition' and related 'fuzzy' notions (for example, the 'art' of agronomy) surfaced regularly. Since it is evident that farmers (whether or not with green fingers) as well as agricultural scientists operate, at least partly, intuitively, it seems worthwhile to investigate this concept in more detail. We will see that the transcendentalist paradigm can shed light on this 'vague' concept.

12 INTELLECT AND INTUITION

12.1 Intuitive operation by farmers and scientists

One of the operational problems mentioned in section 5.1 is the neglect of the role of intuition by agricultural scientists (operational problem 11). The initial assumption in this chapter is that farmers as well as agricultural scientists operate, at least partly, intuitively (whether or not they are willing to acknowledge this). When this assumption is correct, then it would be logical to pay more attention to intuitive operation. We will see that the transcendentalist paradigm can elucidate the 'nebulous' concept intuition, and make it more operational in the sense that intuition can be systematically trained. Dorward (1986a) remarks on the managerial efficiency of farmers:

> "..the limited information processing capacity of the human mind frequently requires that simplifying assumptions be used in problem-solving. The critical question, however, concerns the efficiency of farmers' intuitive problem-solving methods relative to the efficiency of formal, conventional farm management techniques".

Two important issues are pinpointed here: firstly, the human intellect has a limited information processing capacity, and secondly, farmers employ intuitive problem-solving methods. The major hurdle to the development of farm management models, which integrate socioeconomic and biological models, is not related to "computational techniques, but rather may lie in our ignorance of the fundamental processes on-going within the farm-household": adequate understanding of the farm household decision-making complex is lacking (Edwards-Jones & McGregor 1994). Behavioral models are still in the early stages of development, because little is known about decision-making processes (Dent 1995). The non-linear, non-sequential and contingent character of decision-making behavior of farmers in Central Queensland, Australia could not be captured within a linear decision tree model of farming practice (Cox et al. 1995)[1]. In my opinion it is unlikely that we will be able to unravel complex decision-making processes, which include ecological, socio-economic and psychological aspects, as well as factors endogenous and exogenous to the farm household. Also Leeuwis (1993:21) doubts the value of rational decision-making models, and says:

1. Cox et al. (1995) propose to conceptualise the interaction/communication between farmers and researchers as a dance. The dance metaphor is an important step in changing the behavior of FSR practitioners because it is simultaneously participative and extractive. "Researchers are involved in co-producing/choreographing/ rehearsing/performing multiple dances with different farmers" (ibid.). Scientists have to engage in the dance in order to learn the rules: the dance metaphor emphasizes the primacy of action as a source of understanding, and it highlights the need for interaction and engagement in order to effect change. To put ourselves in farmers' shoes is very difficult, at best we can learn to dance with them. This requires the establishment of a direct relationship with farmers; it cannot be done vicariously (ibid.). The dance metaphor fits in with the notion of 'tuning in' to an 'orchestrating' field of collective consciousness. Richards (1989) draws a parallel between the coping skills of concert performers and the coping skills of farmers, when he says: "Perhaps the gap between farmers and researchers could be closed if those on the formal side of the fence reflected upon one lesson in particular from the musical field. Technical perfection is no guarantee that an audience will be moved. Conversely, technically imperfect performances are sometimes great performances". Following Nitsch (1991), Stolzenbach (1994) says: "Farming is not a matter of doing everything correctly: 'It is not a matter of optimising the parts, it is a matter of making a totality run in a satisfactory way' (Nitsch 1991:102)". The art of farming is a performance based on adaptive rationality.

> "..when looking at present-day DSS [Decision Support Systems] in agriculture, one gets the impression that the core activity of DSS developers is to *translate* so-called ill-structured problems into structured ones by means of modeling. [then Leeuwis refers to]..the empirical material on diversity in farming, which shows that farmers effectively apply different models of thought for solving similar problems... This means that these problems cannot be 'structured' into an unambiguous model (even if scientists have frequently attempted to do so). In fact, it can be argued that the very idea of 'structured problems' is closely affiliated to 'hard' systems thinking.." (ibid.:158/59).

Leeuwis takes as a starting point that decision making and problem solving are "fairly chaotic phenomena, and constitute a continuous, more or less gradual process of learning" (ibid.:412)[2]. For FSR practitioners, for example, time is always insufficient to conduct exhaustive site descriptions. In such cases the "feel of field problems counts heavily, supplemented by effective dialogue with farmers" (Calub 1985). Also Collinson (1980) emphasizes that the evaluation of development opportunities in farming systems is done intuitively. Comprehensive studies of all the parameters involved in the complex interactions between farming systems performance and human environment are not always feasible: frequently an intuitive knowledge of interacting factors will have to suffice (Beets 1990:630). Mutsaers (1994) concludes in an evaluation of four FSR projects that all crucial insights, on which concrete interventions are based, are obtained with informal methods, mainly through high quality field observations and intuitive judgements. Scheuermeier (1988) considers intuition as important as hard data, simply because farming families frequently decide intuitively. Intuitive operation plays an important role in the informal or exploratory surveys in the diagnostic phase of the CIMMYT approach to FSR (Diagram 3 in chapter 2). Most researchers (including social scientists), however, have a strong preference for formal questionnaire surveys over informal surveys, because the 'hard' data from a questionnaire are believed to be more valid and useful than "the impressionistic results of an informal survey" (Horton 1984). Nevertheless, formal questionnaire surveys often generate data of poor quality, and result in conclusions which are too general. Moreover, the planning, implementation, and analysis of results can be extremely time consuming (ibid.). Even with close supervision of (frequently ill-trained) enumerators, results in formal questionnaire surveys may be disappointing. In the CIMMYT methodology (carefully implemented) formal questionnaire surveys are mainly used to ensure credibility with outsiders, i.e., non-team members (Maxwell 1986b). The general experience is that relatively little is learned from formal questionnaire surveys after well-conducted informal surveys have been implemented (Galt et al. 1982, Horton 1984, Mutsaers 1994). To my mind, this underscores the effectiveness and

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2. Leeuwis (1993:412) says: "In order to develop adequate CT [communication technology] that support [decision making and problem solving] processes, ... it seems important to explore empirically how such processes evolve in day-to-day practice. That is, I recommend the use of inductive methods, whereby primacy is given to participant observation and qualitative interviews". In my view, Bos (1974) has used such an empirical approach (section 1.2, Diagram 1). Intellectual insight in heuristic processes of rhythm, however, might be difficult to obtain in the sense that 'the continuously adapting play between poles' cannot be easily monitored (section 11.4). I doubt whether training in the model of Bos will result in significantly better decision making and action. To my mind, the rhythmic processes simply must be 'lived'. Bos (ibid.:213) maintains that his model can be learned, and that the balance between, for example, the cognition- and choice-process can be 'felt' or 'sensed' by participants, which results in an improved ability of judgement (ibid.:110). Unfortunately, the right-hand side of his model -the choice process- is restricted to *talking* about decisions. Only in the polarity between words and deeds, which is not included in his model, actual engagement in *action* can be realized (section 1.3). I think that empirical investigation of decision making processes is difficult, because of the role of intuitive operation. People are not discursively aware of intuitive heuristics: they cannot be verbalized. It might be a more fruitful approach to train intuitive skills to the largest extent possible.

efficiency of intuitive operation. Maxwell (1986b) argues that FSR practitioners need above all empathy and insight - “both of which are obtained more effectively by visiting a small group of farms every week [as done in case studies] than by supervising large teams of enumerators [in formal questionnaire surveys]”. Often the most important aspect of case studies is not the formal data collected, but the conversations with farmers which give a real understanding of their management practices (ibid.). In my experience, both informal surveys and case studies depend on a good rapport with farmers, and on skillful intuitive operation by researchers. The use of informal, participatory techniques by researchers does not imply, however, that intuitive insights of farmers will be expounded. At best, farmers’ ‘tacit’ knowledge or know-how will be revealed (see section 12.3).

Box 24: References to the concept ‘intuition’ and related notions in earlier chapters.
The categorization of farm-households into recommendation domains is simply an educated, possibly intuitive, operation (Shaner 1984: section 5.1-operational problem 10). With regard to priority setting in research, Woolley & Tripp (1994) remark that structured planning tools are not a substitute for experience, intuition, intelligence or hard work (section 5.1-operational problem 6). Vierstra & Ndiyoi (1994) remark that formal priority setting will never completely replace intuitive operation (section 4.4.3). The lack of transparency inherent in intuitive decision making hampers communication, and blocks therefore interdisciplinarity within FSR teams as well as participation from other stakeholders (Seegers et al. 1994, Dent 1995: section 5.1-operational problem 6). Also Wallace & Jones (1986) argue that intuitive operation can impede interdisciplinarity, and that intuitions need to be formalized and made accessible to other team members (section 5.1-operational problem 11). Kleene (1989) refers to insight in farming systems as the ‘art’ of the profession (section 5.1-operational problem 11). Maini (1987) says that successful practitioners of systems analysis pursue their trade more as a ‘craft’ than as a science (section 2.5). Van der Ploeg (1987) remarks that about fifty years ago agricultural science -the classic agronomy- was still described as an ‘art’ (section 7.3). Engel (1995) speaks of the ‘art, craft and science’ of agronomy (section 7.3). Campbell (1996) argues that the ‘art’ of fostering group synergy is delicate, and demands empathy with the target stakeholders (section 6.2). According to Engel (1995) intuition, knowledge, ability and context go hand in hand to produce an effective facilitator: a large part of what successful innovation networkers do is ‘playing around’ (section 6.2). Spaargaren (1997) refers to a practical consciousness, an ‘automatic pilot’ which steers routine actions (section 3.2). Baer (1989) argues that all human thinking rests on basic assumptions or intuitions, and that it is impossible to think without such initial intuitions (section 1.4).

A well known example of intuitive operation are farmers with ‘green fingers’ who obtain high yield levels without clearly assignable reasons. “Without physiological and agronomical knowledge some farmers with ‘green fingers’ are able to reach high production levels” (Rabbinge 1986). Dutch horticulturists frequently refer to individual skill and craftsmanship in terms of ‘green fingers’: “The term ‘green fingers’ does often have a magic connotation; it is used mainly if existing knowledge falls short in explaining the sometimes striking differences...between enterprise results” (Leeuwis 1993:277). In this context Leeuwis (ibid.:294) speaks of the ‘fuzzy’ nature of gradual learning processes. A shortcoming or rationalist bias in recent writings on ‘farming styles’ is that:

> “farming styles emerge predominantly as well-elaborated and *explicit* strategies that are *consciously* adopted by individual farmers... Farmers’ doubts and uncertainties are hardly exposed, nor are *less discursive forms of consciousness* and *less strategic types of action*” (ibid.:268) (italics added).

This refers to the level of 'practical consciousness' in Diagram 5 in chapter 3 (Giddens 1984). Also the concept 'art' in Box 24 contains a fuzzy, unintelligible aspect which does not belong to the domain of the discursive consciousness: it refers to something beyond the reasoning intellect.

Leeuwis (1993:86) argues that sharp distinctions between scientific and non-scientific knowledge are not very helpful: both are produced in a social process. He refers to Knorr-Cetina (1981), Lynch (1985) and Latour (1987) who have shown persuasively that "even in a scientific laboratory the production of knowledge is inherently connected with...authority, intuition, hierarchy, personal and other...aspects" (ibid.). Also scientific facts are social constructions. Leeuwis maintains that it is not evident if and how non-scientific knowledge can be integrated in Management Supporting Systems (ibid.:14). Frouws & Van der Ploeg (1988) are of the opinion that *l'art de la localité* cannot be put into a computer. Later on we will see that incorporation of *l'art de la localité* in computer programs is difficult if local knowledge is partly based on intuitive heuristics. Engel (1995:269) says that many farmers and research and extension managers have reached a "deep, often intuitive understanding of the way innovation is organized"[3]. While the farm management economist Collinson -one of the founding fathers of the CIMMYT approach to FSR in Eastern and Southern Africa- rejected formal farm management approaches in favor of a more intuitive and qualitative style, intuitive operation continues to be problematic in FSR teams. Says Sutherland (1987):

> "...it is important to recognise that a simple faith in, and dependence on, intuitive skills is perhaps the biggest handicap to clear role definition for sociologists (especially anthropologists) operating in the region. While it would be very difficult to imagine a good sociologist (or for that matter a good farming systems economist or agronomist) working in FSR who did not have intuitive skills, the need for the development of a more systematic and clearly formulated set of approaches and methods remains critical. While intuitive skills tend to provide critical insight, they are generally less easy to elaborate into a clearly defined role than the economist's use of models and the collection and manipulation of quantified data".

Also others advocate a more systematic approach to the application of intuitive skills and qualitative analysis (see Box 24: Wallace & Jones 1986, Woolley & Tripp 1994, Vierstra & Ndiyoi 1994, Seegers et al. 1994, Dent 1995). Some authors remark, however, that a formalization of partially intuitive processes (e.g., priority setting in research) can never completely replace intuitive skills. In my view the enhancement of intuitive skills must receive at least as much attention as the formalization of intuitive processes. Gatter (1993) observes that an intuitive approach is not strongly encouraged in Zambia's FSR teams "precisely (if not explicitly) because it tends to subvert methodological uniformism". In his view anthropology and sociology display a tendency to self-marginalization, because of the (according to him defensible) lack of methodological rigor in these disciplines. This indicates that the establishment of interdisciplinarity within and without FSR teams cannot be realized without an explicitation of the role of intuitive skills (see also Box 24).

Box 24 and the literature references given here above demonstrate that intuition does play a role in farming and in agricultural research, although in most cases this role is not made explicit. The

3. "All the business about FSR and research-extension linkage is really groping for a mechanism whereby researchable issues are elucidated and prioritised. This, surely, is the function of research managers? FSR, and its derivatives, are formal, cumbersome mechanisms trying to mechanistically do what used to be done automatically and intuitively. Why is this so? Is it lack of experience? Is it lack of motivation in the form of poor salaries? Is it a bureaucratic response to a creative need?" (James Biscoe: personal communication 09-11-1989, Uyole, Tanzania).

current emphasis on indigenous knowledge and farmer participation underscores the need to pay more attention to intuition. Intuitive operation is not only important in agricultural science, but seems to be part and parcel of scientific discoveries in general. Koestler (1989:196) remarks that the verification of discoveries comes *after* the act: “the creative act itself is for the scientist, as for the artist, a leap into the dark, where both are equally dependent on their fallible intuitions”. Welwood (in:Wilber 1985:133) says: “Much scientific and philosophical argumentation and reasoning is often a working back from a conclusion arrived at intuitively, adding the logic or proof steps afterwards”. Also the process of development of this thesis, and the work experiences and study of literature which underlie it, involved intuitive operation (I will come back to this issue in the epilogue where I present an additional reflection on scientific justification). In my view the simple fact that farmers operate partially intuitively, is sufficient reason to pay more attention to this faculty. While in the positivist paradigm intuition is not acknowledged because it is considered ‘unscientific’, most FSR practitioners acknowledge intuition only with hard data backup (section 5.1: operational problem 11) (based on my review of the literature, I get the impression that also most constructivists assume this last position). In the transcendentalist paradigm intuition is not only acknowledged as an important faculty, but the enhancement of intuitive skill is emphasized (see also Table 8 in chapter 6). To my mind, farmers as well as scientists complement logical reasoning with intuitive operation.

12.2 Intuition: the holistic art of anticipation and integration

The following three paragraphs draw heavily on the work of A.D. de Groot, who studied intuition in relation to computer chess and life in general. He wants to strip the concept ‘intuition’ of its irrational halo and make it analyzable and open to research (De Groot 1986). This halo blinds the common sense of adherents through devotion and that of opponents through irritation (ibid. 1985). The distinction between ‘knowledge’ and ‘intuition’ is that precise knowledge can be completely verbalized and rationally justified, whereas intuitive operation cannot (ibid. 1991:3). The function intuition is, by definition, both non-rational and rational (ibid. 1986). It is non-rational according to the criterion of explicability (we cannot explain rationally why we ‘intuit’ what we ‘intuit’), and rational according to the criterion that intuitive *anticipations* are always supposed to contain at least some objectively valid information. Since the outcome or product of intuition is not only subjectively but also objectively informative, intuition is in principle testable. The fact that we do not precisely know *how* intuition works, can be no reason to label it as ‘vague nonsense’. A ‘believer’ in intuition is often implicitly assumed to be responsible for explaining how it works. Instead of swallowing the implication and thus being silenced, proponents must dispute the unfair requirement implied (ibid. 1991:8). In these days of computer modeling ‘precise’ knowledge on how something works actually means: ‘precise enough to program it’. But since we do not know how intuition works, intuitive operation cannot be built into computer programs. Intuition is rule-based cognitive processing “where the rules consist of generally valid, experience-based heuristics, the details of which are not readily accessible to consciousness” (ibid. 1986). Intuition is based on ‘fuzzy’ rules. In the midst of problem solving processes our total problem conception is full of uncertainties, complexity, fuzziness, and ambiguity. This reminds us of the difficult task of FSR practitioners who have to gain a holistic overview of complex farming systems. In real life situations the use of intuitive heuristics is the rule rather than the exception (ibid. 1991: 26). Intuition is omnipresent and indispensable in almost every type of rational decision making (ibid. 1986). Intuition completes logical reasoning, for example, in the selection of research priorities after diagnostic surveys have been implemented (Box 24; operational problem 6:section 5.1). As potential problems are abundant and possible solutions multiple, priority setting in on-station and on-farm research is essential. Although various criteria for the evaluation of possible solutions can be specified, the final decision remains based on 'educated' estimating and guessing (Tripp & Woolley 1989). Criteria such as, for instance, profitability and compatibility with the farming system are not easy to address. In my experience priority setting exercises are indeed somewhat 'vague' procedures which cannot be completed by strictly logical, step-by-step reasoning. Intuition assists in 'pruning the tree of possibilities to be investigated' or in 'selective search', as De Groot (1991:18) puts it.

Intuition is similar to perception in the sense that both perceptual and intuitive processes are holistic in nature. "Intuiting is often experienced as a sort of seeing; but then, it is seeing the unobserved or unseen as yet: *anticipating* what will become, in the sense of 'seeing' what later will prove true or essential, or, what must be done or will happen" (ibid.:26). The faculty intuition is often characterized by words and expressions such as: illumination, flash of insight, vision, something gets clear, suddenly see something, something is clarified or revealed, to see the cohesion, and the German 'Schauen'. It appears to be based on "abilities akin to pattern recognition and pattern understanding" (ibid. 1986). Intuitive know-how is a *skill* in the sense that it shows a "prohibitive resistance against being rendered in words" (ibid. 1991:36). It is a 'jump' process, in which the 'jump' or 'creative act' emerges from an intuitive source[4]. In the model of Bos (Diagram 1 in chapter 1) the thinking in the cognition-process suddenly 'sees' how the facts are interrelated, and in the choice-process the practical imagination suddenly 'sees' the route to a certain goal (Bos 1974:27). Intuitive heuristics constitute 'what computers can't do' (De Groot 1987b). Summarizing, De Groot (1991:41) characterizes intuitive skill as:

> "...the art of anticipating by means of a holistic process, in which inputs of a variety of sources and kinds, some of which are uncertain or ambiguous -often intuitively guessed themselves- are integrated in an incompletely known way that is likely to prove valid".

Intuitive skill -the art of using adequate intuitive heuristics- is an art of anticipation, and hence in principle testable and open to scientific investigation (ibid.:43). The importance of intuitive skill -as a holistic art of anticipation and integration- for FSR practitioners, who must acquire a holistic farming systems perspective under often difficult field conditions, can hardly be overrated.

De Groot holds the opinion that it is possible to upgrade one's intuitive capabilities by training - at least to a certain degree. Intuitive skill seems to differentiate among individuals as a result of "factors of both nature and nurture" (ibid. 1991:39). Since intuitive heuristics are learned by experience (De Groot 1991, Snoek 1989, De Vries 1989, 1991, 1992) field experience is essential for FSR practitioners and other agricultural scientists. De Groot (ibid.:46) refers to intuition as 'the art of forgetting': precise information is forgotten in favor of anticipations which are based on non-

4. Also Koningsveld (1976:131) refers to 'creative jumps' in his discussion of the process of concept formation. A creative jump is an 'Aha Erlebnis': a certain concept is formed which makes that one suddenly 'sees' the solution. Concept formation displays an irrational character: it does not proceed along logical lines and it is not based on facts, since the 'facts' themselves, that should form the starting point, are also established in processes of concept formation (ibid.: 139). Facts are man-made concepts. This shows that vaguely understood processes underlie the process of formation of knowledge.

precise, often ambiguous but hypothetically valuable, information. However, when we are continually engaged in stepwise, discursive thinking -in logical reasoning on the basis of precise facts- then more 'vague' information will be neglected, precisely because of its lack of detail. This would imply that the continuous identification with the rational-empirical consciousness must be lifted in order to become receptive to intuitive information processing. When 'the inner talk' calms down and *inner silence goes together with alert attention* (section 8.1), then intuitive processing of ill-defined information is more likely to occur. The Indian philosopher Patanjali, who lived some 2000 years ago, described in hisYoga Sutras techniques which can develop abilities such as intuition. The techniques, however, work only when one is in a very specific state of consciousness: one must be "at the borderline between the complete mental stillness of transcendental consciousness and the faintest impulse of a thought" (Russell 1990:168) (see Diagram 10 in section 8.1). Schulte (1978:95) defines intuition as a very refined level of the intellect, at the junction point of transcendental consciousness but still in the relative world. The efficacy of thinking depends upon "the ability of the mind to catch the thought at its subtlest state. If the thought is picked up at the source of thinking, it is picked up where it is strongest and most vital. The art of thinking lies in drawing the mind back to the source of thought" (Maharishi Mahesh Yogi 1968:139). When the conscious capacity of the mind is enlarged to the greatest extent possible, then "the mind gains the ability to work from any subtle or gross level of consciousness" (ibid.:259). The faculty intuition can be unfolded by creating a receptive ground for it. A highly developed intuition is the natural consequence of a fully developed awareness.

Synthesis of previously unassociated concepts -creativity- mostly takes place in the deeper levels of the mind[5]. The effect of a meditation technique such as TM is that thoughts begin to enter the conscious mind at earlier stages in their development, not only during meditation but in daily activity as well. Since the subtler levels of thought are less structured than grosser ones, there is more chance of making cross-connections. These cross-connections are made quite spontaneously and without conscious direction. Fruitful associations or intuitive insights, however, are no good if they cannot be formulated and communicated: one must be able to "both make spontaneous cross-connections and then develop a verbal or symbolic expression of that synthesis" (Russell 1990:87). The secret of creativity is to move between the surface level of logical thought and the deeper level of 'subtle' thought in order to bring "the insights gained in the depths out into the world where they can be useful" (Campbell 1975:138). Vague, subtle thoughts are more powerful in the sense that they contain many latent possibilities (ibid.:140). In order to gain *inspiration* we have to return to the source of thinking, to the level of *spirit* (ibid.:141). The ability to develop intuitive insights *and* make them accessible to others, in order to stimulate communication, interdisciplinarity and participation (Box 27), requires simultaneous functioning of the two hemispheres of the brain. Electroencephalogram (EEG) research suggests that meditative practices establish a state of balance between the left and right hemispheres (Russell 1990:63). There is scientific evidence that higher levels of EEG coherence (section 9.4) measured during the practice of TM are significantly correlated with increased fluency of verbal creativity, increased efficiency in learning new concepts, higher verbal IQ, and clearer experiences of transcendental consciousness (Travis 1979, Orme-

5. Swanson & Oates (1989:35) distinguish four components of creativity: vision, imagination, intuition, and confidence. About intuition they say: "Creative decisions can't always be rational. When you are dealing with something that doesn't exist yet, it's hard to obtain facts. That's why creativity must often rely on intuition - on gut feeling and the inspired hunch" (ibid.).

Johnson & Haynes 1981, Dillbeck et al. 1981, Maharishi International University 1992). Research findings indicate improved left and right hemispheric functioning in meditators (expressed in improved verbal and analytical thinking *and* improved synthetic and holistic thinking) (Maharishi International University 1992)[6]. A person who can use both halves simultaneously can begin "to live that long sought for synthesis of reason and intuition" (Russell 1990:66). The co-existence of discursive-rational thinking and intuitive thinking is a divergent problem that must be 'lived' at a 'higher' level of awareness (section 11.1). A dynamic balancing of these two 'opposing' modes of thought -a continuously adapting play between these poles- is required. It is the regular alternation of two poles which results in progress (section 11.1)[7]. One can *distinguish* between discursive thinking and intuitive thinking, but both modes of thought probably occur in a swiftly moving rhythm, so that they cannot be meaningfully *separated* [8]. To my mind, both modes of thinking must be trained to the greatest extent possible, so that, ultimately, the two faculties operate simultaneously. In the final analysis, intellect and intuition are the two sides of a coin, a Janus-faced reality (section 8.4)[9]. In Table 14 I have listed some paradoxes which are closely related to the intellect-intuition paradox (based on Table 13 in chapter 11).

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6. Research findings on improved left and right hemispheric functioning have been published in *The Journal of Creative Behavior* 13 (1979):169-80, 19 (1985):270-75; *Perceptual and Motor Skills* 62 (1986):731-38; *Journal of Clinical Psychology* 42 (1986):161-64; *Gedrag:Tijdschrift voor Psychologie* [Behavior:Journal of Psychology] 3 (1975):167-82.

7. The common observation that flashes of intuition occur when the mind is in a relaxed state (e.g., during day-dreaming) can be explained as follows. When a person makes a great effort to solve a certain problem through long and intensive reasoning, the mind can be stretched to its furthest limits, and then suddenly give up or 'let go' (Russell 1990: 42). The person spontaneously transcends all thinking at the grosser levels, and gets access to the level of transcendental consciousness, or, at least, the more subtle levels of thinking. Such *coincidental* transcending makes the mind more receptive to intuitive processing of data and information. Only through a *systematic* process of getting in and out of transcendental consciousness, however, the mind gets *accustomed* to subtler levels of thought. Haphazard access to subtle levels of thinking cannot result in sustained creative (scientific) work. In a similar vein as long and intensive thinking may trigger a 'letting-go' attitude, existential crises may trigger an attitude of 'let go' and result in spontaneous occurrences of transcendental experiences (Gelderloos 1987:17). It is not the aspect of suffering and unhappiness, but the mechanism of 'letting go' or 'surrender' which is the critical element in the process of transcending (ibid.). The (common) idea that artists and scientists must suffer in order to come to creative work is mistaken: when people would be enlightened -have permanent access to transcendental consciousness and live in a situation of 'bliss'- then their 'output' would be greatly enhanced (quantitatively and qualitatively). Also the TM technique is based on the 'letting go' mechanism. Says Gelderloos (ibid.:19): "Transcendental consciousness can only be attained spontaneously, it cannot be gained by 'force'. During the [TM] practice the most optimal conditions are created for transcending to occur. This is done by keeping the mind alert, yet undirected". A mantra -a thought with a sound value conducive to the transcending process, but without specific meaning- is used as a vehicle allowing the mind to experience finer levels of thinking until the mantra fades away completely, and transcendental consciousness is gained (ibid.:20).

8. In the final analysis, one can *distinguish* between 'the transcendence' (the universal world) and the intellect (operating in the relative world of space and time) but they cannot be *separated*, since the immanent aspect of Spirit pervades also the relative world of the intellect. Intuition emerging at the interface of 'the transcendence' and the most refined level of the intellect can, therefore, not be *separated* from grosser levels of thinking. Both subtle and gross thinking are aspects of the immanent Spirit.

9. In the following table I have tried to summarize Koestler's (1989:180-196) view on creative activity.

Comic	scientist	artist

Table 14: Some paradoxes related to the intellect-intuition paradox

Intellect	Intuition
analysis	synthesis
differentiation	integration
reductionism	holism
deconstruction	(re)construction
self-assertive	integrative
reflection	experience
'thinking-being'	'being'
active	receptive
dynamism	silence
research	spirituality
outward-oriented	inward-oriented
knowledge	wisdom

HAHA! reaction	AHA reaction	AH... reaction
Collision between logically incompatible frames	fusion of previously unrelated cognitive frames	co-existence of logically incompatible frames
Self-assertive	middle region of continuum	self-transcending, integrative

Koestler says: "...all creative activity -the conscious and unconscious processes underlying the three domains of artistic inspiration, scientific discovery and comic inventiveness- have a basic pattern in common: the co-agitation or shaking together of already existing but previously separate areas of knowledge, frames of perception or universes of discourse. But conscious rational thinking is not always the best cocktail shaker. It is invaluable as long as the challenge does not exceed a certain limit; when that is the case, it can only be met by an undoing and re-forming of the mental hierarchy, a temporary regression culminating in the bi-sociative act which adds a new level to the open-ended structure" (p.195). "Bisociation means combining two hitherto unrelated cognitive matrices in such a way that a new level is added to the hierarchy, which contains the previously separate structures as its members" (p.183). "...associative routine means thinking according to a given set of rules on a single plane, as it were. The bisociative act means combining two different sets of rules, to live on several planes at once" (ibid.). "Comic discovery is paradox stated - scientific discovery is paradox resolved" (p.186) and "art is a school of self-transcendence" (p.193). The co-existence or juxtaposition of bisociated contexts is exemplified in, for example, poems. "When you read a poem, two frames of reference interact in your mind: one governed by meaning, the other by rhythmic patterns of sound. Moreover, these two matrices operate on two different levels of awareness - the first in broad daylight, the other much deeper down..." (ibid.). "...the poet's voice is bi-vocal, as he bisociates sound and meaning" (p.195). And, says Koestler (ibid.:179): "To unlearn is more difficult than to learn; and it seems that the task of breaking up rigid cognitive structures and re-assembling them into a new synthesis cannot, as a rule, be performed in the full daylight of the conscious, rational mind. It can only be done by reverting to those more fluid, less committed and specialised forms of thinking which normally operate in the twilight zones of awareness" (see also Koningsveld in footnote 4). In my view, 'to unlearn' the continuous identification with the rational-empirical consciousness, and to operate on different levels of awareness or 'to live on several planes at once', can be achieved through meditation techniques. In the state of 'enlightenment' transcendental consciousness and discursive consciousness co-exist, are maintained simultaneously: enlightenment is all paradoxes transcended. Spiritual dis-covery is paradox lived. Intellect and intuition co-exist as a reality that is simply 'lived'.

In today's society the massive generation of information makes it increasingly difficult to cope with all available data. It seems as if one has no choice but to rely more and more on intuition in order to separate the wheat from the chaff (Swanson & Oates 1989:139). As we have seen above, this elusive ability can be deliberately cultivated in a process of transcending, in which the human mind not only reaches its own most basic level (the field of transcendental consciousness), but also the most basic level of nature (the field of creative intelligence). Strong intuitive skills are a result of being attuned to this field, which is characterized by holistic, orchestrating qualities. However, reflection-in-retrospect on intuitive insights remains important, the critical intellect must not be thrown overboard[10]. Also De Groot (1991:47) argues that intuition must not replace "down-to-earth data collecting, or what can be done by strict reasoning, but complement it". The 'art' of neglecting the facts of a problem situation and their obvious relationships, in favor of "converting general impressions into promising anticipations", must be balanced by strict logic. He says that the question *how* to strike a balance between strict reasoning and intuitive anticipation, cannot be answered in general terms; it depends on the case and person (ibid.). In his view learning to operate intuitively requires a certain *daring*: this 'crucial attitude' entails the guts to guess 'holistically', the courage to trust in one's own anticipations, and the courage to check, modify and possibly reject intuitive insights, and to learn from errors (ibid.). Persons with a strong intuitive skill are self-confident, non-dogmatic, flexible and self-critical, and have a substantial introspective ability (ibid.) (these are some of the characteristics ascribed to self-actualizers). When rigidity in cognitive functioning is learned (due to training in relying solely on hard 'objective' scientific methods), then unlearning, in principle, must be possible. Training in intuition is possible to the extent that a person's 'daring' can be enhanced (ibid.:48). A categorical denial of the educability of intuition does not make sense (ibid.). When scientists argue that intuition is unreliable and thus irrelevant, then the danger of a self-fulfilling prophecy looms large because ignored functions remain underdeveloped and atrophy (Duintjer 1988b:123). Although intuitive operation as such cannot be trained (because it takes place at a level of consciousness we are not discursively aware of), the receptivity for intuitive thinking can be enhanced - for example through meditation techniques.

12.3 The art of agronomy

The 'vague' aspect of the *art* of agronomy and the *art* of fostering group synergy (section 12.1) is, in my view, related to the intuitive, not-precisely explicable heuristics which are involved. Although strong intuitive skills seem indispensable for FSR practitioners and facilitators, this aspect of adequate performance hitherto did not receive much attention. In addition to intuitive heuristics, the art of agronomy also involves 'tacit' knowledge. Following Frouws & Van der Ploeg (1988), Leeuwis (1993:113) argues that farmers' knowledge arises from "the permanent interaction between manual and intellectual labor (i.e., it is connected with craftsmanship)"[11]. The rules underlying such

10. It is always possible that interpretation-in-retrospect of, as such appropriate, intuitive insights results in mis-interpretation and thus inappropriate action. Moreover, enlightened persons are for the transformation of accurate intuitions into concrete actions often dependent on other (not yet enlightened) individuals, who might thwart this transformation. Even enlightened persons cannot circumvent a 'low quality' collective consciousness.

11. With reference to Kolb's theory of experiential learning, Leeuwis (1993:288) argues that the opposition,

craftsmanship can become self-evident habits, which remain, however, difficult to explain to somebody else. Much of the professional initiation of students also consists of 'learning by doing' through which they acquire a 'tacit' knowledge (Sheldrake 1989:267). This tacit knowledge or 'know how', that comes only through practice or experience, cannot easily be expressed in words (Gremmen 1995)[12]. The attempt in the scientific knowledge system to establish an institutionalized separation between 'doing' and 'thinking' is not conducive to a close contact with the agricultural practice, in which acting and investigating take place simultaneously. Two basic philosophical presuppositions of the positivist, so-called 'subsumption model' are that human action is knowledge-based, and that knowledge is acquired separately from the action which is based on it (ibid. 1993: 9). In this model the natural sciences produce universal, nomological knowledge or natural laws from which the technological sciences derive technical rules, which, in turn, can be used to solve practical problems (ibid.:16)[13]. Gremmen (ibid.:159) proposes the 'interplay model' as an alternative to the subsumption model. In the interplay model doing -not knowledge- is central: knowledge does not cause action, but is a consequence of action (ibid.). *One learns by doing*. Thinking is effective action in the domain of existence (Clark 1997; section 8.4). Since innovation in farmers' practices does not derive from scientific discovery in a linear sequence (ibid.:160), and science and technology are 'practices' themselves, the interaction with local, indigenous practices deserves more attention. This underscores the importance of field experience for FSR practitioners: in the 'interplay' model they have to learn 'to dance' with farmers (see footnote 1). FSR practitioners need contextual knowledge, which is grounded in researchers' personal field experience (Colin 1994)[14]. Although one can distinguish between explicit and implicit (tacit) *scientific* knowledge, explicit and implicit local, *indigenous* knowledge, and *intuitive heuristics* -which play a role in both these forms of knowledge- a separation does not seem meaningful, and also not practically possible.

Several authors claim that the inherent lack of transparency in intuitive decision making blocks interdisciplinarity within FSR teams and participation from other actors (Box 24; section 5.1-operational problem 6). In the perspective of the transcendentalist paradigm, however, the main bottleneck to interdisciplinarity is a 'low quality' individual and collective consciousness (section 11.3). To ascribe communication breakdowns to intuitive operation alone, is an oversimplification.

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indicated by Kolb, between learning by 'feeling' and learning by 'thinking' (or grasping via apprehension versus grasping via comprehension) is rather debatable. [Apprehensions refer to all those things we know "instantaneously without need for rational inquiry or analytical confirmation", while by means of comprehension "we introduce order into what would otherwise be a seamless, unpredictable flow of apprehended sensations.." (Kolb 1984:43)]. Says Leeuwis (ibid.): "...'concrete experience' and 'abstract conceptualization' are closely intertwined in that such experiences are only imputed with meaning on the basis of larger frames of meaning that are embedded in actors' life-worlds. Hence, it can be argued that the experiencing of apprehensions and intuitions involves, at the same time, an abstract conceptual process. Of course, the extent to which actors are -at a particular point in time- discursively aware of different aspects of this process may differ, but, in my view, this does not justify the fundamental opposition made".

12. With regard to the way practitioners gain tacit knowledge, Schön (1983) speaks of 'reflection-in-action' where practice and theory are not separated (in: Stolzenbach 1994).

13. The name 'subsumption' model refers to 'to subsume': a specific, concrete situation is a special case of a general situation. It refers to a hierarchic and asymmetric relation between science and farmers' practice (Van Hengel 1995c).

14. Colin (1994) says: "Awareness of local is an excellent antidote against the reductive oversimplifications of the great theoretical constructions with universal claim, especially when the purpose is to understand peasant practices in a specific environment".

Moreover, intuitive heuristics are an integral part of human decision making, which can never be completely avoided by more structured approaches. Fresco (1993) remarks that the use of computer models in techniques such as ‘multiple goal planning’ leads to a better insight which is not only based on ‘Fingerspitzengefühl’. If this means that ‘Fingerspitzengefühl’ must be as much as possible eliminated, then I beg to disagree. To my mind ‘Fingerspitzengefühl’ or ‘intuitive insight’ is indispensable for acquiring a holistic view of complex farming systems. A highly developed intuitive skill supplemented with computer modeling makes sense, but model building without intuitive insight is unlikely to be successful. Sophisticated computer hard- and software might induce an escape from reality through a flight into so-called more ‘scientific’ approaches. As a matter of fact, however, the complex reality of the farming systems perspective is often reduced to some easily quantifiable factors[15]. It seems as if many agricultural scientists are not pleased with the ‘art’ like character of agronomy, and in order to gain (or retain) the status of an academic discipline one looks for methods to give the ‘art of agronomy’ a more ‘scientific’ appearance[16]. If this ‘scientization’ entails more and more computer modeling without adequate attention for training of intuitive skills, then one is probably on the wrong track[17]. Also Beek (1993) argues that the complexity of reality might be lost to sight when, for the sake of scientific status and in order to be able to work with computers, one simplifies landuse to manageable relations. Computer modeling certainly can be useful, but also increases the (already large) gap between farmers and scientists, especially so in LICs.

Computer science is based on the assumption that “relevant knowledge can be explicated and unequivocally represented by means of symbols and/or languages that adhere to a certain syntax” (Leeuwis 1993 :32). As indicated before, however, people make use of many rules of interpretation that they are unable to explicate. Leeuwis (ibid.:67) says:

> “...it is quite striking that, although a complex model has been necessarily made very explicit (at least to such an extent that it is programmable), it often remains largely hidden for the user. In that sense computer programs tend to mystify [underlying] arguments [and assumptions]”.

In this context Hamilton (1995:150) recommends to ‘crawl before you run’: let users make pen and paper exercises before they go for computer excercises. In that way it is possible to open up the

15. In this context Röling (1993) remarks that in M.Sc. courses at Wageningen Agricultural University students are taught the FSR philosophy, but, in the end, one-sided, limited models gain the upper hand and the attention for the social dimension fades.

16. The current craze for biotechnology and genetic engineering might be another attempt to give agronomy a more ‘scientific’ status. Fujisaka (1994) argues that there is “an infatuation with biotechnology as a top-down cure-all” in the CGIAR centres, which might threaten ‘down-stream’ farmer participatory research. I think that some biotechnology research might be useful for the large group of resource-poor farmers, but, more often than not, the large investments in such research by (private) companies cannot be recuperated from that specific target group. In general, sophisticated biotechnological research will not be directed towards this group, simply because the main goal is profit making. Moreover, most LICs cannot afford the huge investments required for such research, and will remain for many decades to come dependent on industrialized countries. The release of genetically engineered organisms in the environment, in the long term probably resulting in genetic pollution and disruption of the environment, is both unnecessary and dangerous. The ill-fated ‘synergy between over-optimistic scientists and over-eager businessmen’ and ‘strategic ignorance’ -“the convenient lack of evidence concerning dangers”- might bring us in a similar position as nuclear power did (Fagan 1995:13). In fact, genetic engineering is more dangerous than nuclear technologies, because mistakes will be irreversible.

17. Weeda (1996) argues that universities must not only pay attention to training in outward-oriented research techniques, but also to training in inward-oriented research techniques, for example, in intuitive skills.

black box, the underlying processes are understood and the computer program gets a status[18]. One can argue, quite unexpectedly, that when computer programs tend to mystify the underlying line of argumentation for users, they are not very different from intuitive heuristics, in the sense that here also the line of argumentation remains largely hidden for outsiders (as well as for the persons who employ intuitive operation). Only the programmers themselves might know all the underlying arguments and assumptions, but they tend to forget them. Moreover, 'physical' technologies carry within them a 'societal code', and it can be argued that computer hardware reflects and promotes 'digital thinking' (Leeuwis 1993:24). A single reliance on computer programs might thus propel the continual identification with the rational-empirical consciousness, which in turn promotes computer modeling, and so on and so forth. This would be an unfortunate development, since, in the end, it is impossible to program computers in such a way that they display intelligence (Winograd & Flores 1991:93, Capra 1996:274). Common sense cannot be programmed into computers, and common sense -garden logic- is what we need to develop sustainable farming systems[19].

12.4 The art of phenomenology

De Groot argues that training in intuition is possible to the extent that a 'daring' attitude can be developed (section 12.2). Also De Vries (1989) maintains that intuition itself is not transferable, yet the attitude required for developing and utilizing intuitive abilities can be acquired. With reference to Steiner he mentions two supporting abilities of the process of intuitive thinking: the ability to form concepts and the ability to work with images (successively, the inspirative and imaginative ability). Although intuition itself cannot be practised, the two supporting abilities and the earlier mentioned 'art of forgetting' can be trained (ibid. 1992). In the inspirative ability the forgetting -having an empty, yet alert consciousness- is the most essential element (ibid. 1991). The imaginative ability starts with an unprejudiced empathizing with a situation -identify oneself, as it were, with the phenomena- so that a feeling for the internal cohesion of a situation develops (ibid. 1991, 1992). In phenomenology unprejudiced empathy as well as unprejudiced, open-minded perception are essential (ibid. 1992). Room for intuition only emerges when scientific knowledge, and experience, tradition and indigenous knowledge, are abandoned (ibid.). To my mind, unprejudiced empathy and perception -grounded in the 'art of forgetting'- are not easily acquired due to the fact that most people are 'imprisoned' in the continual identification with the rational-empirical consciousness. The key question is whether an 'empty yet alert' consciousness can be obtained in a *systematic* way[20].

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18. A similar procedure must be followed when agricultural scientists with insufficient understanding of biometry start using statistical programs for the analysis of their experiments. On several occasions I have observed that statistical programs are applied 'mechanistically' without adequate understanding of experimental design and analysis. It is recommendable to analyze several experiments by pen, paper and calculator before one starts to use computer programs.

19. Referring to Winograd & Flores (1991), Capra (1996:274) gives the example of computers which cannot understand human language in a meaningful sense, because they cannot recognize the context in which sentences are always embedded. Let's take as an example the two sentences: 'Tom had just received a new toy. He was just opening the box when Jim entered the room'. While we immediately assume that the box contains the new toy, a computer cannot make this straightforward inference because it does not hold the same set of common sense ideas and expectations.

20. Koningsveld (1976:133), for example, maintains that perception is always perception through 'conceptual

For scientific and practical purposes *random* access to transcendental consciousness will not do. It follows that *systematic* methods which provide *regular* access to transcendental consciousness are a precondition to the effective application of phenomenological approaches. In my view the Goethe-Steiner inspired phenomenological approach can become effective when large numbers of farmers and scientists get regular (preferably permanent) access to the field of transcendental consciousness[21].

If the phenomenological approach claims to be able to overcome the separation between subject and object -i.e., to overcome 'the mistake of the intellect' (section 11.2)- then this method must allow for a transcending of all activity of the mind. In phenomenology one attempts to alternate between intellect and feeling, between open-minded, abstract-conceptual thinking and unprejudiced sensory perception, between inspirative and imaginative abilities, between head and heart, between cognition and affection (Van Mansvelt 1981). If, however, these switches are made at the level of the discursive intellect -in a conscious mode- then it seems to be a rather 'artificial' undertaking. The

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glasses' - without concepts perception is impossible. This metaphor of concepts as 'mental glasses' does not hold true completely: normal glasses one can put on and off at will, but a network of concepts cannot be used at one's own discretion. Concepts create order in a chaos of impressions, but at the same time they 'encapsulate' people: they become part of the personality and direct the thinking and acting. They determine what one can think and what not (ibid.:137). Conceptual changes are possible, but only in times of a conceptual crisis when a new paradigm emerges. Koningsveld does not entertain the possibility of an 'empty yet alert' consciousness. See also Baer 1989 (section 1.4).

21. Whether the Goethe-Steiner inspired phenomenological approach *itself* provides *regular* access to transcendental consciousness, and can be easily learnt by people of all walks of life, is not clear to me. Hitherto only a limited number of people are practising this approach, and its effectiveness in developing sustainable farming systems on a broad scale remains to be seen. I must admit that I never practised Steiner's approach myself, but it is evident that it is not easy to abandon 'system' and 'lifeworld' (in Habermas' terminology). With regard to the 'art of forgetting' Maharishi Mahesh Yogi emphasizes that one should not make any attempt to forget: "trying to forget amounts to remembering what one aims to forget" (in: Russell 1990:45). Trying of any kind increases mental activity, and holds the attention to the surface levels of thought (Russell 1990:45). Any method that does not transcend itself, along with all other mental activity, can never take the mind to a state of complete inner silence (ibid.:47). This implies that methods which aim at unprejudiced empathy and perception must *transcend their own activity* in order to reach the level of pure consciousness (section 8.4). Whether the Goethe-Steiner inspired phenomenological approach transcends -in a systematic way- all mental activity, including the most subtle levels of thinking, is not clear to me. If this is not the case, then the approach remains subject to limitations of the ego personality, and hence a rather subjective method. Unprejudiced empathy -identification with phenomena in the outside world, an experience of unity of subject and object- demands access to 'higher' states of consciousness (ibid.:126) (section 8.2). Ecological spirituality refers to this direct experience of fundamental interconnectedness. In order to verify the effectiveness of the phenomenological approach in establishing 'higher' states of consciousness, its proponents could be subjected to similar scientific scrutiny as, for example, TM-ers. 'Higher' states of consciousness are reflected in many physiological and psychological parameters that can be (objectively or inter-subjectively) measured. When farmers or agricultural scientists who employ the phenomenological approach score significantly better than a control group on these parameters, then there is at least an indication that the approach results in enhanced individual performance, which makes it more likely that also in the art of agronomy performance will be better. It is possible that some individuals have, by nature, a relatively 'stress-free' neurophysiological system and, therefore, access to higher states of consciousness, which enables them to apply the phenomenological approach in an effective way. Beekman & de Jonge (1996), for example, refer to the clairvoyance of Steiner. Only statistical comparison, however, of a sufficiently large group of people who are trained in the phenomenological approach with a control group, can indicate whether training in this approach is an effective method to enhance, for example, creativity and intuitive skill. In this context it might be of interest that the TM-Siddhi program aims, among other things, at the enhancement of the abilities of sight, hearing, smell, taste and touch. A refined level of functioning of the senses would facilitate the phenomenological approach.

(more or less) swift alternations require (more or less) conscious attention, which implies that one never gets completely out of the rational-empirical consciousness. This means that 'deep' transcending -to the level of the field of transcendental consciousness- cannot occur (see footnote 21). I have the impression that the 'fuzzy' art of phenomenology enfolds at the level of the practical consciousness, but does not give access -in a systematic way- to the interface of practical and transcendental consciousness[22]. A synthesis of intellect and feeling, however, can only be *spontaneously* 'lived' at this interface. It must be a natural and easy process.

If persons employ phenomenology to study farming systems and claim that the domain of spirit cannot be excluded from such investigations, then category errors, in which different modes of knowing become mixed up, must be avoided (Diagram 11 in section 8.4). In the phenomenological approach the mind of the investigator looks at (at least) three different levels of *being*: matter, mind and spirit[23]. When in the phenomenological approach investigators attempt to *think* about the spiritual domain -that is the impression I get from the (limited) literature I studied (footnotes 21 & 22)- then the concepts formed are necessarily paradoxical. This might explain the 'fuzzy' nature of the approach ('fuzzy' to 'outsiders' at least). While the quality of the hermeneutic test in phenomenology depends upon the quality of the community of *intersubjective interpretors*, paradoxical reason can only be verified by awakening mode of knowing number 1 in Diagram 11 - which requires engagement in *trans-subjective* techniques for consciousness development. Knowledge of the spiritual domain can be verified or refuted by equally trained 'peers' - as is the case in the material and mental domains (section 8.4). *If* ,however, in the phenomenological approach paradoxical reason is confused with mode number 1, then a serious category error is made.

12.5 Conclusion

Farmers and agricultural scientists operate, at least partially, intuitively. Logical reasoning is complemented with intuitive operation, or vice versa. The successful use in FSR of informal surveys, characterized by a large degree of intuitive operation, underscores the effectiveness and efficiency of

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22. This impression is based on the fact that phenomenologists at Wageningen Agricultural University do not explicitly refer to the possibility of a state of pure consciousness. See, for example, Van Mansvelt J.D. (1995). 'Research design & ecological agriculture. Workshop F800-204'; and Van Mansvelt J.D. (no date). 'Developing viable concepts for the readjustment of modern agriculture: steps towards real holism'. In the last paper Van Mansvelt refers to Steiner, who speaks of the connection and unity of sensory perceptions and ideal conceptions as in a process of breathing. Breathing is an automatic process which does not require any conscious attention. In the same paper, however, Van Mansvelt speaks of a 'third eye', an extra kind of awareness that must *supervise* the *thinking* which relates sensory perception with conceptual perception, and we must *be aware* of our thinking, feeling and acting. In Christian mysticism one speaks of 'the eye of flesh' (sensory perception), the 'eye of reason' (conceptual perception), and the 'eye of contemplation' (Wilber 1985:267), but Van Mansvelt's 'third eye' does not seem to be identical to this 'eye of contemplation' which is spirit's *direct* knowledge of spirit (mode of knowing number 1 in Diagram 11 in chapter 8). The 'eye of contemplation' is the main method of the transcendentalist paradigm: this 'eye', however, transcends *all activities* of the mind, it refers to *pure* awareness.

23. Diagram 11 presents a very simple three-level hierarchy with only three realms of *being*. Steiner, for example, distinguishes many more realms of *being* including gnomes, fairies, etc. (Beekman & de Jonge 1996). In Kundalini Yoga seven levels are distinguished (Wilber 1985a:255). For the purpose of this study, the three levels in Diagram 11 are adequate.

this faculty. The current emphasis on indigenous knowledge and farmer participatory methodologies demands explicit acknowledgement of the role of intuition in the farmers' way of life. Although intuitive skill -a holistic art of anticipation and integration- is based on 'fuzzy' experience-based heuristics, it is in principle testable. Its non-explicable character, however, makes it highly resistant to attempts to build it into computer programs. Intuitive operation as such cannot be trained, but the receptivity for intuitive thinking can be enhanced. This requires a lifting of the continuous identification with the rational-empirical consciousness. Intuitive operation takes place at a very refined level of the intellect, at the junction point where inner silence goes together with alert attention. The receptivity for intuitive operation can be enhanced through regular contact with the field of transcendental consciousness, and it requires field experience, i.e., frequent contact with farmers. Strong intuitive skills are a result of being attuned to the field of creative intelligence - a field with holistic, orchestrating qualities. The co-existence of discursive-rational thinking and intuitive thinking is a divergent problem that can be spontaneously 'lived' at 'higher' levels of awareness.

The 'vague' aspect of the *art* of agronomy (and the *art* of fostering group synergy) is related to the intuitive, non-explicable heuristics which are involved. Such *arts* are learned by doing. A similarity between intuitive heuristics and computer programs is that in both the underlying line of argumentation remains largely hidden to outsiders. In the art of phenomenology unprejudiced empathy and unbiased, open-minded perception are based on the 'art of forgetting'. Since most people, however, are 'imprisoned' in the continual identification with the rational-empirical consciousness, an 'empty yet alert' consciousness is not easily obtained. For scientific and practical purposes *random* access to transcendental consciousness will not do. To my mind, *systematic* methods which provide *regular* access to transcendental consciousness are a precondition to the effective application of phenomenological approaches. Intuitive operation at the interface of the practical and transcendental consciousness must be a natural and easy process. Practitioners of the phenomenological approach must take care that category errors, in which different modes of knowing get mixed up, are avoided. When (gross or subtle) *thinking* about the spiritual domain is primary, then paradoxical reason might be confused with spirit's *direct* knowledge of spirit. The transcendentalist paradigm makes the 'fuzzy' concept 'intuition' operational in the sense that systematic training becomes possible.

While intuitive skills of individual team members *can* have destructive potential within FSR teams, it is also true that the time and emotional energy dissipated in 'battling-it-out' to a consensus (section 5.1-operational problem 11) can be reduced by an enhancement of intuitive skills. Regular access to the field of transcendental consciousness results in both a 'higher quality' collective consciousness, which facilitates the reaching of a consensus, and in stronger intuitive skills which might result in more aligned opinions and decisions. A combination of formalized methodologies (based on discursive thinking in order to make analyses more transparent) and intuitive operation seems to be the best option. In a similar vein, the 'unproductive infighting' between on-station and on-farm researchers (Box 11 in section 4.4.6) can be circumvented.

The conclusion of this chapter is that we learned more about F, M and A (Diagram 2: section 1.3). The framework of ideas underlying FSR and other relevant concepts (F) have been further clarified: the concepts 'intuition', 'art of agronomy', and 'art of phenomenology' have been elucidated. Methodologies (M) to make these concepts operational -to the largest extent possible- have been indicated: regular access to the field of transcendental consciousness and field experience. With regard to the actors in the field of rural development (A) we have learned that their receptivity for intuitive operation can be enhanced. The main issues ‘holism’, ‘interdisciplinarity’ and ‘attitudinal factors’ (an attitude conducive to intuitive operation can be developed) have been further elucidated.

13 SUMMARY AND CONCLUSIONS

Part I: FSR theory and practice, and main issues selected (Chapters 1 to 5)

The gap between FSR theory and its actual practice resulted in the main research question of this study: '*why is it so difficult to improve the ability of FSR teams to develop sustainable farming systems*'. The answer to this 'why' question results in suggestions for an improved methodology, and thus closing the gap between FSR theory and practice. FSR theory does make sense, although conceptual confusion continues to plague the 'fuzzy' FSR concept. In FSR theory the complexity of farming systems of resource-poor farmers and the centrality of the human factor are emphasized. Farming as 'a way of life' demands a farming systems perspective, which is at odds with the ever-continuing specialization in agricultural research. The practicability of the comprehensive FSR concept remains problematic, this is demonstrated by a long list of operational problems. These problems can be centered around four main issues: holism, interdisciplinarity, attitudinal factors, and lack of countervailing power. In Diagram 5 (chapter 3) I have provided an analytical perspective for the interpretation of my work experiences and the FSR literature studied. This diagram is based on literature in the fields of social psychology and the sociology of rural development. It elucidates the selection of the four main issues, which are thus grounded in an analytical perspective, an analysis of my work experiences, and a review of FSR literature. The diagram combines an elementary attitude-behavior model with the actor-structure debate. It interlinks actors, structures, attitudes and behaviors with the concepts of collective and transcendental consciousness. The dynamic interplay between 'actors-collective consciousness-structures' is linked to the upper and lower routes of attitude-behavior models. As illustrated in this diagram behaviors are the result of compliance and identification with external agents and the result of 'obeying' basic attitudes (internal norms and values). Compliance and identification can be 'enforced' by many sub-structures in society. These technological, economic, political, social, cultural, educational, and religious sub-structures attempt to influence the beliefs about the consequences of certain behaviors at the level of the discursive and practical consciousness. Societally and environmentally friendly basic attitudes emerge 'spontaneously' at the interface of the transcendental and practical consciousness, that is without intervention of the discursive consciousness. One can say that these basic attitudes guide the application of knowledge and skills in a societally and environmentally friendly direction. The upper and lower routes in Diagram 5 might be distinguished for analytical purposes, but they cannot be separated. They apply simultaneously.

The commitment of agricultural researchers to (resource-poor) farmers must be visible in *relevant* and *high quality* research work, and in an holistic approach to the development of sustainable farming systems, i.e., in a professional attitude. Farmers are experts in their own right who engage in adaptive management, and who may occasionally need support from committed researchers. An holistic approach to the development of sustainable farming systems demands recognition of the multi-dimensionality of the development process (synergy in the mix), and internalization of a farming systems perspective. The conventional approach to bridge the gap between FSR theory and practice is incessant methodology improvement and more training. This results in useful new methods and techniques, but individual team members and the team as a whole cannot cope with the methodological complexity, interdisciplinary communication barriers, skill requirements, and organizational and managerial consequences that are involved. Perhaps a merging of 'hard' systems research with 'soft' systems research and social actor approaches can provide a new paradigm to agricultural research and development. This, however, demands an enhancement of human capability which has yet to be realized by conventional education and training.

Part II: Underlying paradigms (Chapters 6 to 8)

To my mind the operational problems in FSR originate from erroneous theoretical assumptions. An explicitation of the scientific paradigms that underlie FSR theory and methodology contributes to a better understanding of the problematic nature of the four main issues. Contemporary FSR must be positioned somewhere at the point of overlap between the positivist and constructivist paradigms (a systematic comparison of these paradigms is presented in Table 8). Both the positivist 'hard' systems thinking and still novel, constructivist-oriented 'soft' systems thinking in FSR are hampered by a lack of systemic competence with researchers. In resource-poor farming there is neither a simple 'techno-fix' nor a simple 'participation-fix'. In addition to *systemic competence*, a simultaneously holistic and pragmatic FSR approach also demands *high quality collective agency* with the multitude of actors in the rural development process. However, the 'art of fostering group synergy' is delicate and intangible. In order to create joint agency on levels of social aggregation above farm level, large numbers of competent facilitators are needed. Their numbers, however, are small, and hitherto it is not clear whether, and how, large numbers of skilled facilitators can be trained.

The *belief* in the powerful positivist-reductionist paradigm, the *belief* in its ontology (nature of being) and in scientific rationality, must be open to discussion. In the field of agriculture the holistic-organismic philosophy of nature, together with Koestler's Janus-faced 'holons', seems an appropriate alternative to the positivist point of view. The 'holon' symbolizes the missing link between reductionism and holism. The main issues of holism and interdisciplinarity are 'white spots' in FSR theory and practice, they demand fundamental conceptual innovation, at a level above the fragmented agricultural sciences, and new problem-solving methods. In order to go beyond integration in retrospect of sub-solutions developed by disciplinary scientists, and to preserve the irreducible integrity of the farming systems perspective, the 'art, craft and science' of agronomy must be (re)established. Holistic performance, interdisciplinarity and synergy emerge with a dynamic equilibrium of self-assertive and integrative tendencies. With regard to the main issue, 'lack of countervailing power', a dynamic balance of power and countervailing power is required. The holistic argument that 'the whole is more than the sum of its parts' has a certain 'elusive' connotation. The *emerging* synergetic effect of interaction can be puzzling. It is unclear how multidisciplinary teams handle emergent properties.

Both the positivist and constructivist paradigms are grounded in a continual identification with the rational-empirical consciousness, i.e., in *thinking*-being. The step-by-step learning process to go beyond the identification with this consciousness can be referred to as spirituality. Spirituality is in this study defined as the process in which one *systematically* trains the receptivity to gain *regular* access to transcendental consciousness. Instead of only *thinking*-being, the experience of just *being*, of *consciousness-as-such* is emphasized. Various scholars claim that spirituality gives way to participatory *modes of being*, which result in environmentally and societally favorable behavior.

Ecological spirituality, as the *experience* of a fundamental, meaningful solidarity with nature, facilitates the development of sustainable farming systems. In a constructive, post-modern integration of scientific-philosophical reflection and spiritual experience an immanent, horizontal ecological world view and ethic can emerge. Rational thinking is not discarded, but restored to its proper place in the spectrum of modes of being. Spirituality is here understood as individual, free, anarchistic, horizontal and above all *experiential* spirituality. It is not based on dogmas, but on do-it-yourself techniques intended to break the continuous spell of the rational-empirical consciousness. It is unfortunate that in the (laudable) separation of science and religion, which occurred after the Middle Ages, the baby, spirituality, was thrown out with the bathwater of institutionalized religion. In this context the difference between religion, as epitomized in churches and faith, and spirituality is important. True spirituality is gentle *anarchism*. It is nonviolent, quiet, calm, purely mental, but nevertheless intense. Where blind obedience rules, spirituality is excluded. Spirituality refers to the original meaning of religion, i.e., *religare, religio*: to (re)connect to the field of transcendental consciousness. The loss of power by religion and politics resulted in the fact-value dualism. This paradoxical dualism, a dualism which is simultaneously a contributory cause to our unwiseness and an important attainment of Western culture, can only be transcended in 'higher' states of consciousness. In the resulting 'trans-rational progression' facts and values can be distinguished without being separated. Spirituality also displays a paradoxical character since spirit is both *transcendent to*, and *immanent in*, the world. People have to realize the paradoxical unity of transcendence and immanence in order to transcend the anthropocentrism-ecocentrism duality. In a dynamic interplay between self-assertive and integrative tendencies the 'emergence' of an equilibrium must be accomplished.

The environmental problem is an outstanding example of a social dilemma. Since people are 'holons' characterized by personal and public interests, a dynamic balance between the two tendencies, between a selfish quest of maximizing personal utility and negotiated agreement on sustainable use of life-giving ecological services of the biosphere, must be established. At the interface between ecology and human development sole reliance on free market forces and regulatory control might be misplaced. Good governance in the domain of environmental management must be grounded in an experiential spirituality *and* in facilitation of social learning for collective action. In order to overcome the social dilemma of common property resource management both routes in Diagram 5 demand attention. Both individual spirituality *and* negotiated agreement, resulting in collective rational morality, are needed. The distinction between rational morality and spirituality is exemplified in the upper and lower routes in Diagram 5. In my view, experiential spirituality not only facilitates the emergence of environmentally friendly basic attitudes, but also conduces the process of negotiated agreements. Negotiated agreements and collective action in soft systems approaches are frequently based on the acknowledgement that collaboration is the lesser of two evils. The *aposteriori*- and *apriori*-willingness of people to agree to act, and actually to act, is positively influenced by spirituality. Although *aposteriori*- and *apriori*-willingness to act, reactive and pro-active change, rational morality based on negotiated agreements and experiential spirituality, can be distinguished, both routes apply simultaneously. Some scientific evidence which supports the statement that access to transcendental consciousness facilitates processes of negotiated agreements and the emergence of societally friendly behavior, is presented in chapter 9.

Just as mathematical knowledge can be confirmed or refuted by equally trained mathematicians, spiritual knowledge can be checked by equally trained peers, i.e., persons trained in techniques for consciousness development. The domain of spirit is open to investigation by the scientific method, i.e., open to *experiential* validation or refutation. It is easier for laymen to verify the possibility of access to 'higher' states of consciousness, and the beneficial effects thereof, than to test, for example, the claims of atomic physics. A common category error is to confuse thinking and talking about the spiritual domain (paradoxical reason) with direct, non-mediated *experience* of this realm. An 'enlightened' scientist has realized the unity-in-diversity of the knowledge quest: a *differentiated union* between science and spirituality has been established, resulting in insight in societal rationality, in wisdom. Such a scientist has combined the main methods of the positivist, constructivist, and transcendentalist paradigms in a holistic approach. These methods are distinct but not separated. Moreover, a *differentiated union* with nature is experienced. Although 'enlightenment' in principle is open to most people, this potential can only be realized with a shift in current priorities.

Part II: Underlying paradigms (Chapter 9)

Smallholder farming as a 'way of life' is embedded in rural communities in which all aspects of life play a role - i.e., the categories 8 to 1 in my holistic framework for multi-dimensional development (Diagram 12). The claim of FSR to be a holistic approach to agricultural research proves difficult to sustain in actual field situations. Problems of different categories (technical, socio-economic, and cultural) and different levels (farm level, regional level, etc.) are not tackled simultaneously. In reductionist approaches the farming systems perspective (the *cohesion* or *irreducible integrity* of farming systems) easily gets lost. Holism's central theme, the whole is more than the sum of its parts, is not fulfilled. The *dynamic* and *emergent* nature of interactions taking place among numerous actors and their networks, and between these social actors and nature, including forces which lie beyond the interface situation itself, dictates that the development process is beyond definite human control. In order to enlarge our 'steering capacity' we need a new paradigm of development which pays attention to the underlying base of all these interfaces and interactions. Farming systems are intermediary wholes (holons) which can never be completely seen from the narrow perspective of disciplines. *Even when* multidisciplinary FSR teams may operate in a truly interdisciplinary mode, then the farming system under study could still exhibit 'emergent properties' which might be overlooked. Only with a dynamic equilibrium of self-assertive and integrative tendencies can synergy emerge, and 'wholes' become more than the sum of their parts. Only then 'holons' function coherently. This applies to FSR teams, farm-households, and all other higher- and lower-level holons, i.e., to soft *systems.*

Scientific research on the effects of the TM technique strongly suggests that the quality of life in society is influenced by the *quality* of the collective consciousness, i.e., the coherence, and the degree of enlivenment of transcendental consciousness, in this collective consciousness. In Diagram 12 the collective consciousness factor is a more independent variable with an 'orchestrating' quality by virtue of its holistic field effect. The collective consciousness factor underlies the cohesion and coherence of systems. The 'quality' of the coordination of actions implemented by a multitude of actors in the process of rural development, at different levels and in different disciplines, is a function of the 'quality' of the collective consciousness of that group of actors. A 'high quality' individual and collective consciousness *facilitates* the cultivation of societally and environmentally friendly behavior. Access to transcendental consciousness, however, does not automatically result in effective action in the domain of existence. Relevant knowledge and practical skills, which are learned, constructed and evaluated in the upper route, are also necessary. Experiential spirituality can guide the application of such knowledge and skills in a societally and environmentally friendly direction. Access to the field of transcendental consciousness facilitates the implementation of the methodologies of the positivist and constructivist paradigms in a sustainable direction.

The transcendentalist paradigm is characterized by consciousness-mediated manageability: holistic, non-local effects are (presumably) mediated through the agency of the field of transcendental consciousness. Various indicators of the quality of life are simultaneously affected. In addition to mediation by verbal communication in direct social interaction, as practised in, for example, soft systems thinking, mediation of behavioral effects at a distance through consciousness seems possible. Although scientific research on the field *effect* of consciousness provides only *indirect* evidence for the existence of the consciousness factors, the *replicability* and *predictability* of this effect is so persuasive that it certainly warrants further attention from scientists. The everyday 'objective' world is a manifest expression of the field of transcendental consciousness (or creative intelligence): it is a *map* which can be 'objectively' investigated. Scientists as mapmakers can investigate the field *effects* of consciousness, they can map these effects in the 'objective' world, but they cannot 'prove' the existence of the consciousness fields themselves. Scientists as trans-subjective meditators, however, can verify the existence of the field of creative intelligence in their own consciousness. My hypothesis is that the agency of this field facilitates the 'management' of the multiple aspects of sustainable development. Sustainability is an integrative, holistic property which encompasses 'wholeness in human beings' and 'wholeness in society'. Sustainability can be defined as the emergent property of negotiated agreement and experiential spirituality. In the perspective of the transcendentalist paradigm the 'art of fostering synergy' is facilitated by a 'high quality' individual and collective consciousness. In addition to the outward-oriented approaches of the positivist and constructivist paradigms, I recommend an inward-oriented approach which focuses on consciousness development. Summarizing one can argue that the TM technique has two effects: the performance of meditators is enhanced, and meditators contribute to a 'higher quality' collective consciousness, which through its field effect translates into the facilitation of societally friendly behavior.

Diagram 12 illustrates an integration of individual (actor-oriented) and collective (structure-oriented) approaches. The consciousness factors can help us to transcend the actor-structure dualism. Ideally the development of sustainable farming systems should be both actor-driven *and* system-driven. The interplay between actors and structures, however, takes place in the field of collective consciousness. Enhancement of performance of lower-level holons (individual actors) and higher-level holons (structures) is facilitated by the 'orchestrating' quality of the underlying field of transcendental consciousness. Since 'power' is a consequence rather than a cause of collective action, we need to look for the cause, the active ingredient, the glue or cement of collective action. Both critical systems *thinking* (focusing on analyses of power configurations) and soft systems *thinking* (focusing on collective agency) are enacted at the level of the discursive consciousness. The attunement of hard, soft and critical systems *thinking* is not hindered so much by the difference between hard, soft and critical as by their common element, i.e., the reliance on *thinking*-being as the only possible mode of being. However, in a similar vein as there is no simple positivist 'techno-fix' or a constructivist-oriented 'participation-fix' in resource-poor farming, there is also no transcendentalist 'consciousness-mediated fix'. Consciousness development is not an overnight solution: it takes time, and positivist- and constructivist-oriented methodologies remain indispensable in the search for sustainable farming systems.

Part II: Underlying paradigms (Chapter 10)

In the context of the development of sustainable farming systems the constructivist paradigm certainly is a step forward compared to the single application of the positivist paradigm. Nevertheless, the constructivist paradigm needs extension. When the constructivist paradigm is evaluated from the perspective of the transcendentalist paradigm, the differences between the two paradigms as well as possible additions to the constructivist point of view become manifest. An important difference is the hesitance of many constructivists to take up an ontological position. This ontological side-step manoeuvre can mean that all discourse, reflection and action remain confined within the continual identification with the rational-empirical consciousness. The single reliance on *thinking*-being continues. In my view constructivists must distinguish between ontology and epistemology. If scholars claim to be *epistemologica*l moderate constructivists as well as *ontological* common-sense realists, then the ultimate nature of the 'objective' everyday world needs to be explicated. Ontology precedes epistemology. This implies also that moderate constructivists who take an *agnostic* stance toward the ultimate nature of 'objective' reality, easily get entangled in the fallacy of conflating ontology with epistemology.

Constructivist-inspired soft systems approaches aim at the construction of 'ideal speech situations'. The ultimate objective is the synergistic performance of a multitude of actors. This synergy emerges 'when certain conditions prevail'. These conditions are not sufficiently specified however. From the perspective of the transcendentalist paradigm, language-mediated interaction must be supported by consciousness-mediated interaction. A 'high quality' collective consciousness facilitates the emergence of a harmonious atmosphere in which trust and 'ideal speech situations' can flourish. High trust situations are characterized by synergistic communication and cooperation. Synergistic cooperation is not a transaction (a strategic compromise), but a transformation. While compromise means that 1 + 1 = 1½, synergy means that 1 + 1 = >2. The key to such inter-personal synergy is intra-personal synergy. It is not always easy to 'enforce' synergy in 'human activity systems' through 'external' pressures. At higher levels of social aggregation the task becomes increasingly difficult. Large numbers of highly skilled facilitators are needed.

The internalization of constructivist-inspired Participatory Learning and Action Research (PLAR) approaches requires actual engagement in these techniques. I maintain that the initial lack of motivation to adopt such techniques is the problem. Attitudes will have to change first. Practical methodologies to change the attitudes of change agents are not offered in the literature on rural development, except the recommendation to 'just start' with participatory approaches - in the (probably false) hope that the feedback loop in Diagram 5 will do the job. Agricultural professionalism consists of four ingredients: technology, strategy, collective action, and spirituality. Spirituality, in the sense of a 'psychological flip' out of the rational-empirical consciousness, is an encompassing ingredient which through a different 'quality of consciousness' can affect the other three components. Change agents can intellectually understand, and respectfully accept, the presence of an immanent and/or transcendent spirituality, but this will remain a 'vague' concept as long as it is not internalized through direct personal experience. In addition to explicitation of underlying ontologies of farmers and change agents, experience of the common basis of cosmovisions is necessary. Cosmovisions as intellectual concepts certainly are a step forward, but are in themselves insufficient. They refer to the contents of consciousness only.

Time and again, the continual identification with the rational-empirical consciousness crops up as one of the bottlenecks in the development of sustainable farming systems. One could argue that this is quite logical since the transcendentalist paradigm could be seen as a self-constructed, theoretical framework which shows the dangerous characteristics of a 'vicious circle' (see also the epilogue at the end of this study). In section 3.1 I referred to Giddens (1976:139-40) who says that logical circles are only vicious circles if their "closing is treated as an end-point of enquiry, rather than as a beginning". Circular reasoning within scientific paradigms is to a certain extent inevitable, but such logical circles are benign versions of the vicious circles that scientists fear so much (Franck 1996). Since this study is an *exploratory* endeavor, and as such an attempt to break new ground for the development of sustainable farming systems, the transcendentalist paradigm is treated as the beginning of a new enquiry. An enquiry, however, which is not only based on an internally consistent framework but also on research findings which suggest that the concomitant methodology is effective.

Part III: Back to FSR (Chapter 11)

Life is a succession of divergent problems, of opposing polarities which constitute its fabric. Since we ourselves slice reality up into innumerable pairs of opposites, we can also undo this 'mistake of the intellect'. Spirituality can help us to transcend and 'live' these polarities. The co-existence of apparent opposites (paradoxes) results in wholeness and holistic performance. A synthesis of self-assertive and integrative tendencies in FSR teams is an example of a divergent problem that has been transcended. In such FSR teams the whole is more than the sum of the parts. An holistic approach must be based on the acknowledgement and the direct experience of the double-sided reality in which we live, namely the relative world of time-space and dualities, and the universal world of undivided unity. The discursive intellect belongs to the relative world, and cannot 'look beyond' it. The holistic aspect of farming systems, their irreducible integrity, is 'intangible' in the sense that it is incomprehensible. It is beyond the discursive intellect. The number of variables that are at play in agriculture make it difficult to grasp the complexities of farming systems at the intellectual level. Conventional FSR suffers from the 'illusion of intellectual holism'. Farming systems are holons characterized by self-assertive and integrative tendencies.

The point of departure for the development of 'universitas' ('unity-in-diversity' of the sciences) is the scientist, the consciousness of the knower. In addition to cross-connections and overlap between disciplines (inter-disciplinarity), the basic connection, the underlying wholeness, requires attention (trans-disciplinarity). Since regression to pre-disciplinary modes of operation is impossible, the only option is progression to trans-disciplinary operation. Interdisciplinarity is difficult to establish, but even then 'emergent properties' of holons can be overlooked when researchers examine farming systems from the outside. Trans-disciplinarity entails that farm-household members, specialists, and generalists study farming systems from their respective points of view, while they maintain transcendental consciousness in their awareness. In a 'symphonic' agriculture the 'orchestration of synergy in the mix' is facilitated by consciousness-mediated manageability. Trans-disciplinarity entails an integration of scientific reflection and spiritual experience.

With regard to the main issue, 'attitudinal factors', the 'black box' processes of internalization and transformation are important. Information must be internalized into personal knowledge, which, in turn, must be transformed into changes in attitudes and behavior. An enlivenment of transcendental consciousness might facilitate (accelerate and/or partially circumvent) the roundabout process of internalization (the arrows number 1 and 2 in Diagram 5 in chapter 3). Although research on the use of the TM technique by farmers has not been undertaken, the consistent results with other actors warrant a generalization to the group of farmers. The theory formulated in this study gives rise to predictions that can be tested, and is thus scientific. Some examples of *provisional but testable* hypotheses are given in Box 23. So-called 'autonomous' technology development is a fabrication that people can undo through a 'higher quality' collective consciousness. What we need is more wisdom.

At first sight the answer to the main research question -'*why is it so difficult to improve the ability of FSR teams to develop sustainable farming systems*'- is that a long list of operational problems hampers the implementation of FSR theory. Most FSR practitioners believe that the fundamental problem does not lie with the principles of the FSR approach, but with its implementation. To my mind, however, the operational problems stem from two erroneous theoretical assumptions. FSR theory is based on (1) the assumption that an holistic approach can be implemented solely at the level of the rational-empirical consciousness, and (2) in the positivist and constructivist paradigms, which underlie this theory and which are grounded in the continuous identification with this consciousness, the assumption is that other 'modes of being' are not possible. The many operational problems encountered have been centered around four main issues - holism, interdisciplinarity, attitudinal factors, and lack of countervailing power. These, at this point in the study, all have been clarified from the perspective of the transcendentalist paradigm. I have approached the research question from the perspective of these four main issues, and consistently the consciousness factor surfaced as an important element. The answer to the question 'why' is that FSR teams and the other actors in the process of rural development are 'trapped' in the habitual, and therefore largely unnoticed, identification with the rational-empirical consciousness. The logical answer to the question 'how' (section 1.2) is that the ability of FSR teams to develop sustainable farming systems can be enhanced by 'a psychological flip' out of this consciousness. This does not imply that the discursive intellect must be abandoned, but rather that the *sole* reliance on intellectual reasoning, unnecessarily, limits our capacity to find adequate solutions to persistent problems. The dominant positivist paradigm, as well as the emerging constructivist paradigm, need to be complemented with the transcendentalist paradigm. Intellectual understanding *and* internalization of this paradigm (by engagement in its practical methodology) can enhance the ability of FSR teams (and other stakeholders) to develop sustainable farming systems. In that way the gap between FSR theory and practice can be closed. Since sustainability is a holistic property, it cannot be dealt with in a piecemeal fashion. Agricultural science and practice must not be reduced to an unending exercise in correcting symptoms, but rather must work at a level that is common to and integrates all aspects of ecosystems, including people.

In this exploratory study I have not endeavored to test plausible hypotheses (that is, plausible from the point of view of the dominant scientific paradigm), but rather to develop new testable ones. Verification of the transcendentalist paradigm is possible in communities of objective, inter-subjective and trans-subjective 'peers'. The paradigm is defensible or justifiable in three different modes: 1) the direct *effects* of (presumably) access to the field of transcendental consciousness on, for example, physiological health can be verified by methodologies used in the natural sciences; 2) the indirect field *effect* of a 'high quality' collective consciousness on a multitude of indices of quality of life can be verified by social science methodologies; and 3) the *field* of transcendental consciousness *itself* can be verified in a community of 'trans-subjective peers' - i.e., persons who are willing to learn and practise techniques for consciousness development.

Part III: Back to FSR (Chapter 12)

Farmers and agricultural scientists operate, at least partially, intuitively. Logical reasoning is complemented with intuitive operation, or vice versa. The successful use in FSR of informal surveys, characterized by a large degree of intuitive operation, underscores the effectiveness and efficiency of this faculty. The current emphasis on indigenous knowledge and farmer participatory methodologies demands explicit acknowledgement of the role of intuition in the farmers' way of life. Although intuitive skill, a holistic art of anticipation and integration, is based on 'fuzzy' experience-based heuristics, it is in principle testable. Its non-explicable character, however, makes it highly resistant to attempts to build it into computer programs. Intuitive operation as such cannot be trained, but the receptivity for intuitive thinking can be enhanced. This requires a lifting of the continuous identification with the rational-empirical consciousness. Intuitive operation takes place at a very refined level of the intellect, at the junction point where inner silence goes together with alert attention. The receptivity for intuitive operation can be enhanced through regular contact with the field of transcendental consciousness, and it requires field experience, i.e., frequent contact with farmers. Strong intuitive skills are a result of being attuned to the field of creative intelligence, a field with holistic, orchestrating qualities. The co-existence of discursive-rational thinking and intuitive thinking is a divergent problem that can be spontaneously 'lived' at 'higher' levels of awareness.

The 'vague' aspect of the *art* of agronomy (and the *art* of fostering group synergy) is related to the intuitive, non-explicable heuristics which are involved. Such *arts* are learned by doing. A similarity between intuitive heuristics and computer programs is that in both the underlying line of argumentation remains largely hidden to outsiders. In the art of phenomenology unprejudiced empathy and unbiased, open-minded perception are based on the 'art of forgetting'. Since most people, however, are 'imprisoned' in the continual identification with the rational-empirical consciousness, an 'empty yet alert' consciousness is not easily obtained. For scientific and practical purposes *random* access to transcendental consciousness will not do. To my mind, *systematic* methods which provide *regular* access to transcendental consciousness are a precondition to the effective application of phenomenological approaches. Intuitive operation at the interface of the practical and transcendental consciousness must be a natural and easy process. Practitioners of the phenomenological approach must take care that category errors, in which different modes of knowing get mixed up, are avoided. When (gross or subtle) *thinking* about the spiritual domain is primary, then paradoxical reasoning might be confused with the spirit's *direct* knowledge of spirit.

The transcendentalist paradigm makes the 'fuzzy' concept 'intuition' operational at least in the sense that systematic training becomes possible.

While intuitive skills of individual team members *can* have destructive potential within FSR teams, it is also true that the time and emotional energy dissipated in 'battling-it-out' to a consensus can be reduced by an enhancement of intuitive skills. Regular access to the field of transcendental consciousness results both in a 'higher quality' collective consciousness, which facilitates the reaching of a consensus, and in stronger intuitive skills which could result in more aligned opinions and decisions. A combination of formalized methodologies (based on discursive thinking in order to make analyses more transparent) and intuitive operation seems to be the best option. In a similar way, the 'unproductive infighting' between on-station and on-farm researchers can be alleviated.

Final conclusions

It is important that the current gap between hard and soft systems thinking, and between natural and social sciences, is bridged. The continual identification with the rational-empirical consciousness with hard, soft and critical systems *thinkers* is the main bottleneck. In order to create sustainable farming systems I recommend a sustained use of the critical intellect in combination with an *experiential, non-dogmatic* spirituality. A spirituality that can help to guide development in an environmentally and societally friendly direction. A spirituality that facilitates the emergence of rational morality based on negotiated agreements and emphasizes pro-active change. A spirituality that highlights personal transformation through *do-it-yourself* techniques.

The unity-in-diversity of the knowledge quest is expressed in the Janus-face. As a symbol of non-duality it exemplifies that research and spirituality can be simultaneously employed to create sustainable farming systems. Farming systems are 'holons' that can be studied by 'objective' and 'subjective' approaches. The Janus-face is not only looking downward and upward to lower- and higher-level holons, but also to the earth and the heaven: it faces outward and inward, combining 'objective' and 'subjective' approaches in an holistic method. All three components in the title of this study, *farming, spirituality* and *research*, demand attention in the development of sustainable farming systems. *Farming* refers to the centrality of farm-household members, as exemplified in participatory approaches, and to the importance of relevant knowledge and practical skills. *Research* refers to high quality, client-oriented on-station and on-farm research, and *spirituality* points to the 'orchestrating' agency of the field of transcendental consciousness. The Janus-faced reality of Farming Systems Research demands an integration of research and spirituality. Spirituality which is not an escape from reality, but an encounter with reality.

Particularly at higher levels of social aggregation, where a multitude of actors are stakeholders in sustainable rural development, the 'orchestrating' agency of the field of transcendental consciousness seems important. Gaining (permanent) access to transcendental consciousness is for most people a lifelong process, but what matters most is to be on the road. In order to experience 'that which is essentially beyond words', a relatively small shift in time allocation is needed. The proof of the pudding is in the eating. In principle there is no reason why outward- and inward-directed approaches cannot be practised simultaneously.

The current emphasis on market liberalization, global competition and decreasing public investment as the best strategy to achieve global food security and sustainable agriculture, makes it, in my view, difficult for African resource-poor farmers to develop to their full potential. They will not be able to compete with products from the Western world, which after decades of investment in agricultural education, extension, research, land consolidation and subsidies, have gained a nearly unapproachable position. The 'front runner' model in which early innovators capture wind-fall profits, while later adopters are forced to adopt or quit, might push millions of resource-poor farmers out of agricultural production. The divergent problem of 'global market liberalization' versus 'local ecological integrity' might be difficult to solve without more attention to the consciousness factors. To my mind the realization of the slogan 'think global, act local' at the interface between ecology and human development demands access to the field of transcendental consciousness.

14 EPILOGUE: ADDITIONAL REFLECTION ON SCIENTIFIC JUSTIFICATION

Writing a Ph.D. thesis is, as most events in life, a process. In each process that involves human action, one can distinguish -but not separate- three aspects: motive, process and result (Bos 1974:2). Although *scientific* justification of the process of development of theses -i.e., the methodological approach- is common practice in the academic field, the motive and *actual* process of development receive less attention. From a strictly logical point of view, the motive and *actual* process must be presented first, and only then the result should follow. Since academic tradition 'dictates' otherwise, motive and actual process are discussed in this epilogue at the end of the thesis, *after* the results. One can argue that with a period of 20 years between M.Sc. and Ph.D. degree, earning a doctoral degree is not an extension of a study anymore, but becomes part of a biography (ibid.:194). Bos (ibid.:3) and De Vries (1992) plead for a kind of biographical justification of the above mentioned neglected aspects.

As indicated in section 1.2 my main motive to write this thesis originated from feelings of amazement and frustration. A feeling of amazement because I wondered why it was so difficult to implement holistic FSR, and a feeling of frustration because many years of agricultural research and extension (including two decades of FSR) had so little impact on the well-being of resource-poor farmers in East Africa. These feelings of amazement and frustration resulted in the 'why' question. It may be that the desire to make a contribution to human well-being through a Ph.D. thesis is naive, but an inner urge to examine the transcendentalist paradigm on its usefulness to the field of rural development and agricultural research kept me going. The best criterion for selecting a specific field of research is the question 'what inspires you most, what turns you on' (Korteweg-Frankhuisen 1996). Knowledge roots and grows best at the interface of emotion and intellect: here the driving force, the spark that touches a person, originates (Schrijvers 1996). According to Schrijvers (ibid.) conventional science becomes bleak and sterile because of the reduction caused by the gap between disciplines -disciplines which precisely in concerted action can result into a more holistic science- and because of all the apparent opposites that we have internalized - e.g., between intellect and intuition. We tend to limit ourselves to only one pole of the dichotomy instead of 'living' a synthesis of opposites (see Table 13 in chapter 11). In an attempt to avoid that this thesis 'lacks soul', I felt free to refer to various disciplines, discussed the issue of 'pairs of opposites' (section 11.1), explicated my worldview and predispositions (section 1.4), provided an analytical perspective for the interpretation of my work experiences and literature studied (chapter 3), explicated underlying scientific paradigms (chapters 6 to 10), added footnotes with more personal observations, and included this epilogue which presents an additional reflection on the scientific justification of this academic study. I wholeheartedly admit that this thesis is also a kind of ego-trip. An ego-trip, however, financed by myself, and with a hopefully positive effect on societal rationality. In addition to my desire to earn a doctoral degree, I have also chosen for the form of a thesis because I wanted to elucidate the transcendentalist paradigm to the agricultural scientific community (in East Africa, Wageningen and elsewhere). To my mind this paradigm offers practical suggestions to develop sustainable farming systems. It is evident that the development of sustainable farming systems demands contributions from a variety of disciplines. In this study I have tried to construct an internally consistent theoretical framework -the transcendentalist paradigm- which offers the possibility to integrate a multiplicity of disciplines that (ought to) have an impact on agricultural science (section 11.3). This may sound as a pretentious and unmanageable undertaking, and maybe it is, but the fact remains that a sustainable agriculture cannot do without an encompassing scientific paradigm.

Dessaur (1984:351) argues that the fear of most academics of broad approaches and wide-ranging visions -with the inevitably increasing risk of errors and mistakes since one cannot be a specialist in all disciplines- is symptomatic of the positivist mentality. Detailed, analytical and specialized research is necessary, but accumulation of detailed information is meaningless without space to manoeuvre for people with integrative visions and aspirations. In the transcendentalist paradigm the field of transcendental consciousness acts as an integrating concept. The tacit canonization of one type of scientific attitude reduces the breadth and depth, and even practical relevance, of science (ibid.: 352). Dessaur (ibid.) pleads for the admittance of various scientific attitudes (for example, also intuitive and spiritual attitudes) and more flexible rules - rules which, in the end, we make ourselves. It is important to recall that dogmatic empiricism, materialism and reductionism once were grand (and necessary) *heretical, unorthodox* innovations - innovations which proved a step forward in the biography of mankind. Despite its negative side effects, dogmatic empiricism is an improvement compared to dogmatic ecclesiastical or political belief (ibid.:353) (see also Table 11 in section 8.3). In a similar vein, the transcendentalist paradigm might be dissident and radical today but an improvement tomorrow.

The concepts and research methods with which objects of research are approximated must be of the same quality as the objects themselves. The intrinsic nature of objects of research should not be violated by studying them with alien concepts and methods that are foreign to the nature of the objects themselves (Bos 1974:13,213) (this applies also when the objects of research are scientific paradigms. Category errors in modes of knowing must be avoided; see section 8.4). Since the objects of research in FSR -i.e., farming systems- are holistic and dynamic in nature, underlying scientific paradigms and research methods, and also results of research and their effects on researchers and users, must be holistic and dynamic. The transcendentalist paradigm is holistic and dynamic in nature, and its main methodology and the ensuing results and effects indeed have a holistic quality, as suggested by some scientific research. Scientific work starts and evolves with two types of questions: 1) how can we develop a theory that makes facts transparent, a theory that explains phenomena; and 2) how can we operationalize this theory so that it can be recognized in the facts (ibid.:64). The transcendentalist paradigm can explain phenomena that cannot be explained within the positivist and constructivist paradigms, for example, the phenomenon of the field effect of consciousness (see Box 20 in chapter 9). Another example is the main research question in this study: the inability of FSR teams to develop sustainable farming systems cannot be fully explained within the earlier mentioned paradigms. In this study I have attempted to show that the long list of operational problems in FSR, and the four main issues selected, stem from erroneous theoretical assumptions (section 11.5). The two main faulty assumptions -a holistic approach can be implemented at the level of the rational-empirical consciousness, and the continual identification with this consciousness is unavoidable- can be rectified by an operationalization of the transcendentalist paradigm, i.e., an engagement in its main methodology resulting in other 'modes of being'.

The previous paragraph might raise questions with respect to 'stabilizing circularities of belief systems'. Says Chambers (in an footnote) (1997:243):

> "Must any coherenec and consistency be at the cost of circularity, selecting what fits and discarding the discordant? Are reductionist roundabouts necessary for progress with understanding? Perhaps there is no escape, only a willingness to recognize the roundabouts, to get off them from time to time, to

> look at them from outside, to seek and puzzle over evidence that does not fit, to reflect critically, and to doubt, question and be open to change. All positions are then permanently provisional; in human affairs there is then no final reality, no final truth".

One might wonder whether the transcendentalist paradigm is not a stabilizing circularity, a reductionist roundabout that I 'constructed' by selective observation and interpretation (see also section 10.6). This study and its transcendentalist paradigm certainly are 'social constructions', and as such 'permanently provisional'. At the same time, however, the transcendentalist paradigm is not something 'new', it is based on millennia-old insights that have been expressed in many cultures. The only 'new' aspects of this study are that these insights are linked to the field of (Western) agricultural science, and that references are made to a widely available and practised (old) meditation technique that has been subjected to Western scientific scrutiny. However, neither the age of a paradigm nor its number of subscribers can be used as *scientific* arguments (section 10.1). Nevertheless, the first criterion lends at least some credibility to the transcendentalist paradigm, while with regard to the second criterion one can argue that although under Western-trained agricultural scientists the number of subscribers is low, resource-poor farmers might recognize some aspects of the transcendentalist paradigm in their own 'traditional' cosmovisions (section 10.5) (It is important to remark here that cosmovisions might contain elements of 'pseudo-science' and superstition). The above two non-scientific criteria, together with the multiple scientific underpinnings provided in previous chapters, make that I am quite confident that the transcendentalist paradigm can become a 'new' paradigm of development of sustainable farming systems. Moreover, the only way to *really* get off -and look from outside at- 'roundabouts of arguments', is by lifting the continual identification with the rational-empirical consciousness. So there *is* an 'escape' but this requires engagement in techniques for consciousness development. 'Final reality' only can be found at the level of the field of transcendental consciousness. 'Final truths', however, are always *verbal articulations* of experiences of this field, and in the case of non-enlightened persons thus subject to the whims of the ego-personality and dependent on the socio-cultural environment, while enlightened people speak then inevitably in paradoxes (section 8.4). The concept 'stabilizing circularity' also applies to the system of peer judgment in (social) science. De Groot & Van Os (1992) argue that this system results in academic inbreeding, in scientific literature characterized by risk-free variations on earlier models of thought, and in a graveyard of irrelevant data. The risk-free tinkering with details supplants broad visions and mature insights, and unconventional lines of thinking face a disproportionately hard time (ibid.).

In scientific studies more attention must be paid to reflection on the role of the researcher as a social actor (Leeuwis 1993:130). The knowledge and text 'produced' in research cannot be understood without taking into account the agency, projects (long-term goals), interests, normative evaluations and feelings of 'the researched' as well as the researcher. Researchers must not only "present and give voice to the researched as historically and socially situated agents", but they must also deliberately avoid to write themselves 'out of the text' (ibid.:131). Says Leeuwis (ibid.):

> "both knowledge and written text, as constructed by the researcher, are to be seen as outcomes of negotiation processes between the researcher and other actors (e.g., respondents, colleagues, opponents, promoters, etc.) and/or different 'personas' within the researcher. These negotiation processes may either actually take place in a 'physical' manner, but can also unfold in a more virtual manner; that is, as a mental process within the researcher, who either anticipates discussions with other

> actors and/or ‘negotiates’ between the different personas which he or she constitutes in different social contexts or networks”.

Also De Vries (1992) maintains that complete descriptions of research processes, including the researchers themselves, must be provided. Researchers are an integral part of cases, and need to be made visible to others in the presentation of research processes. Only then cases become communicable, transferable. Individual uniqueness must be transcended, but without losing sight of it. In this context Huizer (1996) and Visser (1996), following Fortmann (1974), speak of ‘knowledge in the first person’ and ‘knowledge in the third person’, as exemplified in successively spirituality and science. Kockelkoren (1992:4) refers to the ‘rhetoric’ of academic studies, and speaks of the pretension of neutrality, for example through ‘depersonalization’. Even in psychology the inner life of people is studied by observation of the behavior of *other* persons (Visser 1996, Korteweg-Frankhuisen 1996). Behaviors of scientists themselves are not discussed, as if they are ‘outside and above’ people’s behavior.

I want to mention five ‘events’ which have been important in the shaping of my worldview: 1) the fact that I grew up on a small-scale, mixed farm on sandy soils in a resource-poor environment; 2) in my first year at the university (1970) I read the book ‘Escape from freedom’ by Erich Fromm (1941). This book on the psychology of Nazism was an ‘eye-opener’ in the sense that Fromm emphasizes that societal changes are rooted in the (collective) behavior of individuals, who tend to unload their responsibilities onto someone -or something- else (see also footnote 10 in chapter 1); 3) the period of the early seventies when I was a left-wing student and ‘hippie’ with affinity to ecological farming. Carvallo (1996) argues that the ‘New Left’ and ‘Counter Culture’ movements were part of a continuum: a continuum, however, which was a ‘weird’ hybrid of two opposing ideals in the sense that the simultaneous aspiration for a ‘political utopia’ and a ‘utopia of withdrawal’ created internal tensions. I must say that I never felt this friction because the concept ‘collective consciousness’ integrates these two aspirations (section 9.3) (see also footnote 15 in chapter 11). Moreover, I became quickly disillusioned with left-wing politics because the rhetoric of most student-activists (for example, about the collaboration between intellectuals and laborers) did not fit my experiences in my social environment - a social milieu where long-haired students were treated with distrust. I guess that this discrepancy between students and the ‘lower’ social classes is related to the fact that (probably until today) few students originate from these social strata; 4) in 1972 I started with the TM technique. The initial motivation to meditate stemmed from a vague ‘existential’ feeling, which is best described as: ‘*is that it, is that all life has to offer?*’ (moreover, this decision was also inspired by the era of ‘flower power’). Since secondary school I had the feeling that something was missing in life: the continuous hope that next year would be better -because I would be in a higher class, would go to the university, would become independent from my parents, and so on- was not really fulfilled. In one way or another I ‘sensed’ that searching for happiness in ‘the relative world’ is like chasing shadows. The attainment of a goal brought temporary fulfilment, but soon the next wish cropped up. To my mind, the endless ‘struggle’ to satisfy wishes could not be the ultimate purpose of life, because life had to be ‘logical’ in the sense that permanent happiness ‘ought to be’ a realistic option. Although in those years I could not have formulated my feelings so clearly, the awareness that ‘something is missing’ has always been there. I do not wish to imply that my quest for ‘permanent happiness’ has been fulfilled by the TM technique -far from it!- but at least it offers hope, it might be a relatively effective means to that end. My experience in the last three decades belies that ‘1968’ was just an illusion. *L’image au pouvoir* can be a guiding image for the future (Bos 1974:8), *if* accompanied by practical methodologies. And, finally, 5) more than a decade of living and working at the East African countryside.

Being an FSR agronomist it would have been most 'logical' if I had written a thesis about a set of on-farm experiments implemented during several seasons in one or more farming systems. Although on-farm research is mighty interesting, such an undertaking never appealed to me because of its limited scope. I had the feeling that agronomical problems were not the main issue that hampered development. Only a broader set-up could satisfy my quest for more understanding. Although the starting point of this study is formed by a multitude of practical issues (the operational problems in section 5.1), it attempts to 'go beyond' these 'superficial' problems in order to reach a deeper level of understanding. In my judgment (agricultural) scientists spend a disproportionate amount of time and money on natural objects, while neglecting *the people* who inhabit this planet (see also footnote 10 in chapter 11, and Huizer 1996). At the end of the day, it are people who determine whether or not a sustainable agriculture will emerge. Sustainability is the emergent property of a soft system (section 9.5).

Human cognitive processes, to a certain extent, are steered intuitively (chapter 12). De Vries (1992) claims that it takes courage to present an intuitive method of working because no 'nice stories' can be told but a certain 'clumsiness' characterizes the presentation. Only by including unexpected, non-premeditated events the research process, as it in reality took place, is shown to outsiders. De Groot (1986) says:

> "...when one reviews retrospectively his own daily and professional life regarding argued conclusions and decisions in the past, most of these are likely to turn out to have needed, and actually to have been completed by, intuitive reasoning".

Choices, if not initiated by intuition, are made definite by completing solid evidence with intuitive considerations. The scientific justification of the process of development of this thesis -i.e., the methodological approach- has been presented in section 1.3 (see the general research framework in Diagram 2). This formal methodological approach was not planned at the beginning of my career: actually it was only put on paper in 1996, in an attempt to re-organize an earlier draft of this thesis. Although the methodological approach gives a fairly accurate description of the process of development, the *actual* process proceeded in a less conscious manner than Diagram 2 suggests (this refers to the aspect of 'clumsiness' mentioned here above). Descriptions of actual processes of thinking and doing inevitably take place with hindsight: it are always re-constructions, rationalizations-in-retrospect of processes which involved intuitive heuristics. The methodological approach as presented in section 1.3 is such a rationalization-in-retrospect. Processes that lead to insight are creative processes. Creativity cannot be 'organized' by mere implementation of clearly defined research protocols (Wagemans 1987). One has to distinguish between the implementation of research activities and the actual thinking process in the head of the researcher. Concepts and theories are creative products of the researcher. This thesis presents the *result* of a thinking and doing process of years, but the *actual* process -as it unfolded in reality- cannot be presented because 'fuzzy' intuitive heuristics -creative jumps- were involved (section 12.2). The *re-constructed* argumentation can be illustrated with practical examples from my work experiences and with references to relevant literature, but this does not really elucidate the actual thinking process. The distinction between 'the logic of discovery' and 'the logic of reconstruction' applies here (Wagemans 1987).

Social constructivists argue that the distinction between 'the context of discovery' and 'the context of justification' is meaningless (Luyten 1995:84). In their view *both* contexts are socially-constructed: all knowledge is a social construction. Training of intuitive skill -so important in the context of discovery- does not seem to be a priority issue in the constructivist paradigm (see also section 12.1). The ontological side-step manoeuvre of many constructivists refers to the claim that it is irrelevant whether or not an autonomous, non-contextual 'reality' exists 'because we cannot know it anyhow' (section 10.1). This claim, however, can have as a consequence that they do not want to spend time on methods that provide systematic access to the universal field of transcendental consciousness - the field from which intuitions emerge. Kockelkoren (1992:184) speaks of the 'waste land' of the context of discovery, the 'dumping ground' where participatory modes of knowing and intuitive operation are condoned. In addition to the context of discovery, also the context of justification -the rationalization-in-retrospect- can involve intuitive heuristics. Re-constructions and reflections are always social constructions, but the emergence of accurate intuitions at the interface of the practical and transcendental consciousness is not a conscious 'construction', but a spontaneous process. The use of intuitive heuristics in both the contexts of discovery and justification can be conveniently argued away, but we cannot get away from the fact that they play a role in scientific endeavors. If we would be more honest about our 'rationalizations-in-retrospect' and freely admit that also scientific labor is a social (re)construction and partially based on intuitive heuristics, then we no longer would have to force ourselves, willy-nilly, into a (positivist) methodological straightjacket pretending to be objective (Röling 1995:17). Tarnas (1993: 400) says: "For justification is itself only another social practice with no foundation beyond social practice. ..[in the end justification is not justifiable] by anything beyond personal and cultural taste".

The main elements in the process of development of this thesis are my agricultural research work in East Africa, the recurring periods of reflection in The Netherlands, and the daily engagement in a meditation technique. The research work implemented in East Africa was part and parcel of job descriptions: planning of activities did not take place with the objective -also not at the back of my head- to include them in a thesis. Only after my third job in Africa I started to think about a thesis and wrote a first draft, but during the fourth assignment in Zambia this process came to a halt due to work pressure. In 1996, back in The Netherlands, I embarked on this final version (interrupted by another break of half a year in 1997 when I left The Netherlands to settle in Tanzania). With regard to the necessity to justify to a scientific forum, Wagemans (1987) remarks that tension can arise between the two functions of a scientific methodology: the function to obtain insight in the empirical reality as perceived by the actors can conflict with the function to justify to a scientific forum. This tension between the two wishes of a researcher -the wish to insight and the wish to justification- can emerge especially in contexts where actors behave differently in formal versus informal situations (which certainly is the case in hierarchic research organizations in East Africa). In such a case, Wagemans (ibid.) says, the researcher might decide to use a positivist research methodology in order to make the research results acceptable to a scientific forum, instead of a constructivist-oriented approach which would offer a better chance to gain insight in the socially constructed reality of various actors. The researcher uses the positivist methodology then only symbolically, as a ritual: the research methodology and the results will be classified as scientifically sound, but the methodology does not contribute to new insights. This is exactly what happens when FSR practitioners are 'forced' to implement formal questionnaire surveys in order to gain credibility with 'outsiders' while informal surveys have already provided the necessary insights (section 12.1).

With regard to the main elements in the process of development of this thesis, I want to remark that the approach to my agricultural research work in East Africa was a combination of positivist- and constructivist-oriented methodologies. In the experimental design and statistical analysis of on-farm experiments, for example, I emphasized a positivist-oriented mode of working in order to fight the often clumsy way in which on-farm experiments are planned, implemented and analyzed. In my communication with farmers and other actors, however, a more constructivist-oriented approach was used. The methodology in the periods of reflection in The Netherlands was constructivist-oriented, and characterized by (virtual) dialectical debates with promotors, colleagues, and literature. The daily engagement in a meditation technique is the main methodology of the transcendentalist paradigm, focusing on (individual and collective) consciousness development and experiential, non-dogmatic spirituality.

Since my work in East Africa constitutes a major element in this study, and has been implemented without the intention to use it as material for a thesis, the wish to obtain insight has clearly prevailed over the wish to justify to a scientific forum. Although especially my promotors have provided ample suggestions to study literature which might facilitate the wish to justification, the wish to insight has also prevailed in the (unavoidably personal) selection of literature. In the daily practice of meditation the wish to insight is paramount, while the wish to justification hardly plays a role here (I will come back to this issue). Since I have given preference to the wish to insight, the wish to justification may have suffered in this study. The criterion that a scientific forum must be able to judge the trustworthiness of my findings may not have been fully satisfied (see also footnote 5 in chapter 6). It is possible that my insights are not grounded in the socially constructed reality as perceived by the actors in the rural development process, but are based on personal convictions. A selective use of empirical material can present personal points of view as theoretical insights. The positivist- and constructivist-oriented approaches leave ample space for (subjective) input of the researcher. This makes it difficult for a scientific forum to assess whether the empirical material has been used in a logical and consistent mode. Typical illustrations can enliven and clarify the field of research and make a reasonable case for acceptance by a scientific forum, but they do not prove anything (Wagemans 1987).

In the following example the tension between the wishes to insight and justification, and between the two poles of the (related) informal-formal dichotomy, is illustrated. Local actors in East Africa (for example, researchers) may accept in formal meetings proposals from the top management of the organization to adapt research activities to the actual conditions of resource-poor farmers. In daily practice, however, these proposals are not implemented, and in informal settings the researchers tend to disagree with the top management (on the usefulness of the new approach and/or on practical problems which hamper its implementation). Since follow-up on agreed-upon proposals is often lacking, and disciplinary actions by the top management of the organization are virtually inconceivable (non-performing researchers are not dismissed, only transferred), the status quo is maintained (see section 1.4 where my predispositions are explicated: actors have formal and informal objectives, and the power of the top of organizations to influence events is rather limited; see also section 9.3 where I quoted Latour on the concept of power). Although the FSR philosophy and methodology formally has been accepted in research organizations, implementation remains problematic: apparently the farming systems perspective has not yet been internalized (one obvious reason is a low morale due to low salaries). When members of the scientific forum would have the possibility to ask local researchers why the FSR approach has not been implemented, the reason of low salaries would not be easily mentioned in formal settings. Because of the differing answers given in formal and informal settings, the wish to justify to relative ‘outsiders’ -such as a scientific forum- remains problematic. I might think that I have gained a great deal of insight in local actors’ motivations, but then this is based on *my* interpretation of the *actors’* interpretation of reality (‘the double hermeneutic’: see the last paragraph but one): actors who have ‘hidden agendas’ and who behave differently in formal versus informal contexts. When questioned by a scientific forum, these actors might flatly disagree with my interpretation, depending on their interpretation of the position of the forum. A scientific forum would have to go through the same process of observation, interaction and interpretation as I did -both in formal and informal settings- in order to be able to judge the trustworthiness of my interpretations. From a practical point of view this is impossible (see also footnote 2 in chapter 3).

In section 8.4 I have argued that the verification or falsification of scientific paradigms must take place in a *true* group of *peers*, which in the case of the transcendentalist paradigm implies that a scientific forum (also) must be a community of *trans-subjective meditators*. These ‘peers’ at the same time can be *objective* (positivist-oriented) *spectators* and *intersubjective* (constructivist-oriented) *interpretors*, as long as one is aware of the dangers of disguised reductionism and paradoxical reason (see Table 8-criterion methodology in chapter 6, and section 8.4). Conventional peer review is a component of the upper route in Diagram 5 in chapter 3: compliance and identification with a peer group are important mechanisms in the behavior of scientists, although scientists might not be discursively aware of these mechanisms and/or not willing to explicate them (chapter 6: Introduction). Moreover, *any* paradigm includes a *belief* in a certain ontology that needs to be explicated: not only the nature of knowledge (epistemology) but also the nature of *being* (ontology) must be expounded. The scientific method applies to all those knowledge-claims that are open to *experiential* validation or refutation, as opposed to non-testable, dogmatic proclamations (Wilber 1984: section 8.4). Also the transcendental reality is open to *experiential* validation or refutation. In addition to observation of -and interaction with- other actors as practised in constructivist-oriented approaches, observation of -and interaction with- one’s own consciousness is possible. One can live in a state of witnessing, beyond all interpretation: the silent witness -the field of transcendental consciousness- is not just a theoretical concept or an article of faith, but an ontological reality that can be directly experienced (section 10.1). In fact, direct experiences of the field of transcendental consciousness might be easier to check than interpretations of socially-constructed realities, and this applies even more so to *scientists*’ interpretations of *other actors*’ interpretations of those realities. But -a small snake in the grass- any putting into words of experiences of transcendental consciousness is inevitably *paradoxical*, since it is essentially beyond words. This makes that a scientific forum easily can get annoyed by an apparent lack of intelligibility and precision, or can be deceived by a plethora of verbiage, except when they have personal experience of the field of transcendental consciousness. In short, the scientific paradigm and the research methodology of the community of peers must be ‘true-to-type’. In principle, the wish to justification can be satisfied.

A fundamental difference between natural and social sciences is that in the social sciences the ‘objects’ of study -the actors- are also actively interpreting the world, just as the social scientists do: this is the so-called ‘double hermeneutic’ (Giddens 1976:158). New perspectives on human activity, generated by social scientists, re-enter society as a basis for learning (Röling 1994b). According to Leeuwis (1993:132) actor-oriented researchers have failed to indicate how their approach can help to solve 'practical' problems "other than through relying in a rather gambling-like manner on the 'double hermeneutics' of social scientific knowledge". In his view social scientists should not only generate 'new' rules of interpretation, but also "contribute to their effectuation...and thereby to the emergence of particular structural properties" (ibid.). The effectuation of new rules of interpretation implies 'internalization', resulting in changes in attitudes and behavior, and, finally, in societal changes. Since there is no guarantee that new perspectives will be internalized by the majority of the population, it seems wise to rely not only on the 'double hermeneutic' (the upper route in Diagram 5 in chapter 3), but to engage also in techniques for consciousness development (the lower route in Diagram 5). A 'high quality' individual and collective consciousness *facilitates* the cultivation of societally and environmentally friendly behavior. The field effect of consciousness might support the language-mediated interaction of the 'double hermeneutic'. Anyhow, it seems best to put not all one's eggs in one basket. Since the likelihood that many people soon will start with techniques for consciousness development is not very large (although the interest certainly is on the increase), a two-pronged strategy seems to be the best bet option.

I want to recall here that the transcendentalist paradigm does not have to be accepted at face value, since it provides testable hypotheses with clear-cut predictions that can be (and in non-agricultural fields already have been) subjected to scientific investigation (Box 23 in chapter 11). It is unfortunate that at this moment in time this paradigm has not been tested yet in farmer communities, or in communities of agricultural scientistst for that matter. The fact is that in everyday development practice funds for testing of radically 'new' concepts will not be made available, until a theoretically sophisticated analysis and (at least some) practical evidence have been provided. I hope that this thesis contributes to the fulfilment of these two criteria. For one person it is impossible to 'prove' that the transcendentalist paradigm 'works', since FSR activities always take place in a setting with numerous actors whose dedicated efforts are indispensable in order to achieve success. Moreover, statistical testing requires sufficiently large groups of actors. The (poor or high quality) performance of one FSR agronomist, who happens to subscribe to this paradigm, does not 'prove' anything. Finally, I would like to refer to Kuhn who said that scientists in periods of 'normal science' are no longer 'explorers of the unknown', but tend to limit themselves to further specification of the already known (in: Van Dongen 1996). Whether we are at the dawn of a new 'scientific revolution' is difficult to tell, but to be 'road constructors rather than passive travellers' (Von Krogh & Roos 1996: section 1.4) seems an attractive option anyhow.

ABBREVIATIONS

ANOVA:	Analysis of Variance
a.o.:	among others
ARA:	Adaptive Research Advisor
ARC:	Agricultural Research Centre
ASIP:	Agricultural Sector Investment Program
B.Sc.:	Bachelor of Science
CGIAR:	Consultative Group on International Agricultural Research
CIAT:	International Center for Tropical Agriculture
CIMMYT:	International Wheat and Maize Improvement Center
CIP:	International Potato Center
CPR:	Common Property Resources
CT:	Communication Technology
cv:	coefficient of variation
DSA:	Daily Subsistence Allowance
DSS:	Decision Support Systems
EEC:	European Economic Community
EEG:	Electro-encephalograph
e.g.:	*exempli gratia*: for example
ELA:	Empathetic Learning and Action
FAO:	Food and Agriculture Organization
FINNIDA:	Finnish International Development Agency
FPR:	Farmer Participatory Research
FRG:	Farmer Research Group
FSAR:	Farming Systems Adaptive Research
FSR:	Farming Systems Research
FSR&D:	Farming Systems Research and Development
FSRE:	Farming Systems Research and Extension
FSRT:	Farming Systems Research Team
FSRT-WP:	Farming Systems Research Team - Western Province
GIS:	Geographical Information System
GNP:	Gross National Product
HUKS:	Helsinki University Knowledge Services
i.e.	*id est*: that is
IARC:	International Agricultural Research Center
ibid.:	*ibidem*: from the same author or work
ICRISAT:	International Crops Research Institute for the Semi-Arid Tropics
IDA:	International Development Agency
INIA:	National Institute of Agronomic Research
ISNAR:	International Service for National Agricultural Research
IQ:	Intelligence Quotient
KIS:	Knowledge and Information System
LDC:	Less Developed Country
LIC:	Low-Income Country
LTVIP:	Lower Tana Village Irrigation Program
MIU:	Maharishi International University
MRR:	Marginal Rate of Return
M.Sc.	Master of Science
MVU:	Maharishi Vedic University
N:	Nitrogen
NARS:	National Agricultural Research System
NGO:	Non-Governmental Organization
ODA:	Official Development Assistance
OFCOR:	On-Farm Client-Oriented Research

OFR/FSP:	On-Farm Research with a Farming Systems Perspective
OSR:	On-Station Research
Ph.D.	Doctor of Philosophy
PLAR:	Participatory Learning and Action Research
PPP:	Purchasing Power Parity
PRA:	Participatory Rural Appraisal
RAAKS:	Rapid or Relaxed Appraisal of Agricultural Knowledge Systems
R&D:	Research and Development
RELO:	Research-Extension Liaison Officer
RIDEP:	Regional Integrated Development Project
RMFI:	Researcher Managed - Farmer Implemented
RRA:	Rapid Rural Appraisal
SAP:	Structural Adjustment Policy
SAREC:	Swedish Agency for Research Cooperation with Developing Countries
SIDA:	Swedish International Development Authority
SSA:	Sub-Saharan Africa
T&V:	Training and Visit (extension system)
TAC:	Technical Advisory Committee
TARDA:	Tana and Athi River Development Authority
TM:	Transcendental Meditation
TOT:	Transfer-of-Technology
UAC:	Uyole Agricultural Center
USAID:	US Agency for International Development

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Propositions

1. “We have to be sensitive to this, we have to be sensitive to that. If we get any more sensitive we are going to suffer from sensory overload”
(Harrington L. 1985, commenting on the holistic aspect of FSR. Report of the Proceedings. Farming Systems Socio-Economic Monitoring Tour/Workshop. Asian Rice Farming Systems Network, IDRC and IRRI).

2. The habit of many agricultural scientists to stubbornly insist on LSDs at the one and five per cent levels of significance truly is an addiction to LSD.

3. “If the environmental disasters looming not only in Africa but worldwide are to be averted it must be through methods that do not require a college degree to apply”
(Savory A. 1991: 11. Holistic resource management. Gilmour Publishing, Harare, Zimbabwe).

4. Expatriates and nationals who use the statement ‘this is Africa’ as an excuse for low standards of performance, are doing Africa a disservice.

5. Applied philosophy without practice is empty, but applied philosophy without ‘pure, theoretical’ philosophy is blind (adapted from Kant)
(Lijmbach S. and B. Gremmen 1991: 6. Toegepaste filosofie in praktijk. Wageningse Sociologische Studies 32).

6. It is weird that one can obtain the degree of *doctor of philosophy* (Ph.D.) without ever having read a book about philosophy of science.

7. “There *is* no economic problem and, in a sense, there never has been. But there is a moral problem, and moral problems are...divergent problems, which have to be understood and transcended”
(Schumacher E.F. 1978: 140. A guide for the perplexed, Harper & Row, New York).

8. “So long as our happiness depends upon objects ‘out there’, we are their prisoner”
(Chopra D. 1991: 50. Unconditional Life, Bantam Books, New York).

9. The release of genetically manipulated organisms in the environment is more dangerous than nuclear technology because mistakes are irreversible.

10. The claim that genetically manipulated foodstuffs are safe and, therefore, do not require labelling demonstrates a downright lack of respect for the customer’s ability of judgement.

11. “You can’t always get what you want, but if you try sometime, you just might find you get what you need”
(Song: ‘You can’t always get what you want’, Jagger & Richards 1969).

Toon van Eijk.
Farming Systems Research and Spirituality: an analysis of the foundations of professionalism in developing

sustainable farming systems.
Wageningen, 18th December 1998

CURRICULUM VITAE

Antonius Maria (Toon) van Eijk was born in Someren, The Netherlands in 1952, on a small farm in a relatively resource-poor environment. He received his secondary education at the ‘Carolus Borromeus College’ in Helmond, and obtained the HBS-B certificate in 1970. In 1978 he obtained his M.Sc. Degree from Wageningen Agricultural University, The Netherlands, with a major in tropical crop science and minors in tropical animal production, development economics, and non-western agricultural co-operatives and finance. During his studies he spent almost one year in Brasil on a practical period.

After graduating in 1978, he became an associate expert to FAO in a crop production and protection project in Nampula Province in Mozambique. In 1982 he joined the Dutch Government-supported Lower Tana Village Irrigation Program in the Coast Province in Kenya. After returning from Kenya in 1985, he was involved in seven short-term assignments (Angola, Cape Verde, Guinea Bissau, Indonesia, Tanzania, Mozambique, and half a year at the Royal Tropical Institute in Amsterdam). From 1989-1991, he was Adaptive Research Adviser in the FINNIDA Support Program to Uyole Agricultural Centre, in the Southern Highlands of Tanzania. From 1991-1993 he participated in three short-term assignments (Mozambique and Tanzania), and started working on his Ph.D. thesis. In 1994-1995 he worked in the Farming Systems Research Team of Western Province, Zambia (for the Royal Tropical Institute, Amsterdam). After this assignment in Zambia, he worked on his Ph.D. thesis in The Netherlands, until he left for Tanzania in June 1997.

In Tanzania he started a small business entreprise together with his Tanzanian partner-in-life, Zaina Maimu, finalized his thesis, and established himself as a free-lance, independent adviser in the field of rural development.