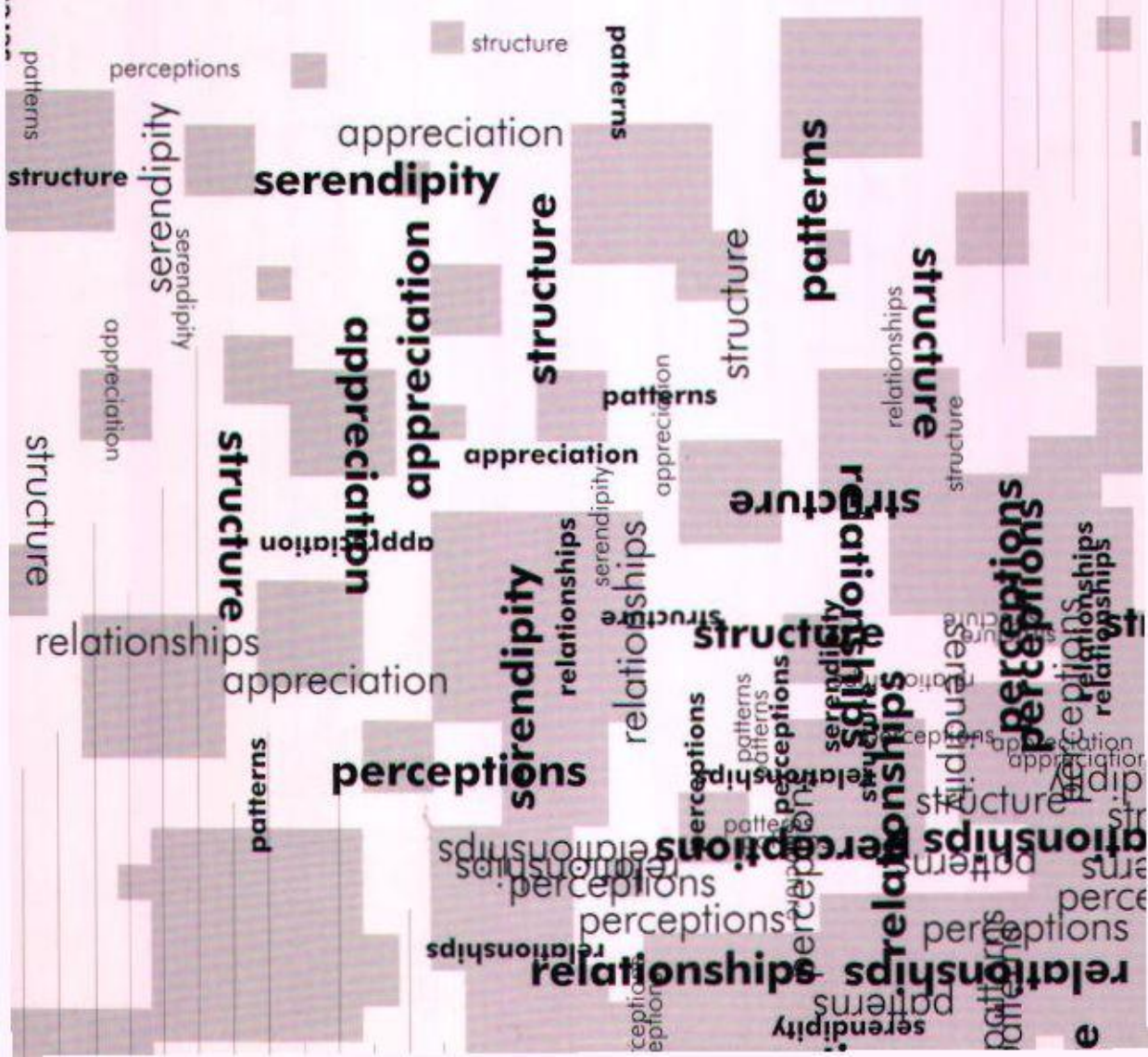
Paul G.H. Engel

Facilitating Innovation

An Action-Oriented Approach and Participatory Methodology to Improve Innovative Social Practice in Agriculture



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Propositions[1]

1. The concept of 'knowledge transfer' is theoretically inadequate and practically dangerous to describe and/or study the exchanges involved in agricultural innovation. 'Networking', as a dynamic action-oriented concept focusing on engagement, relationship management and social interaction is a contender for replacing it (this thesis).

2. Agricultural innovation is a diffuse social process of both individual and collective inquiry by actors from different social practices who interactively probe relevant volitions, propositions and contexts in order to formulate new or modified problem definitions and make practical choices with respect to possible solutions (this thesis).

3. Innovation configurations should be taken for what they are: context and time-bound forms of social organization to be discussed, modified and/or discarded whenever they are perceived as standing in the way of adequate resource management practices (this thesis).

4. RAAKS has proved multi-facetted as an approach and potentially useful as a methodology. Its 'active ingredients' are people (this thesis).

5. Excessive use of so-called 'output steering' contributes to lack of innovativeness because it assumes, unjustly, that what we learn from our experiences can be defined in advance.

6. The notion that a single optimum solution exists for each problem we are able to define, has been a major conceptual stumbling block to the development of agricultural science.

7. The lack of expenditure on research into the social construction of innovation in Dutch agriculture mirrors contentment with current innovative performance, even though the critical situation in which the agricultural sector finds itself provides no motive for such satisfaction.

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[1] Propositions ('stellingen') presented with the doctoral dissertation *Facilitating innovation, an action-oriented approach and participatory methodology to improve innovative social practice in agriculture*, to be defended by Paul G.H. Engel on friday januari 20th, 1995, 16.00 hrs, at the 'Aula' of the Agricultural University of Wageningen.

8. In situations where the desired direction of change is as yet unclear or contested, extension should concentrate upon facilitating meaningful dialogue on relevant social and technological issues rather than insist upon promoting technical change per se.

9. Innovation can be taught (Buijs, 1987[2])

10. The current wave of interest for organizing national debates on salient issues (national economists' debate, national agricultural debate, captains of industry on trafic jams, etc.) has yet to lead to investments in developing appropriate methodologies to structure such debates and guarantee relevant outcomes.

11. The level of aggregation at which social actors can reach accomodations, take decisions and act upon these rapidly becomes a more relevant indicator for the pace of technological innovation than any of the characteristics of the specific innovations involved (Röling, pers.comm.).

12. As Ed van Thijn convincingly demonstrates[3], 'bringing national politics closer to the people' is possible after all. If only politicians dare to show they are human.

Paul G.H. Engel January, 1994

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[2] Buijs, J.A. (1987). Innovation can be taught. In: *Research Policy* 16, 303-314.

[3] Thijn, Ed van (1994). *Retour Den Haag, dagboek van een minister.* Amsterdam: Van Gennep.

Facilitating Innovation

Promotoren:

dr. ir. N.G. Röling,	bijzonder hoogleraar m.b.t. landbouwkennissystemen in ontwikkelingslanden
dr. ir. J.L. Simons,	hoogleraar bedrijfskunde i.h.b. bestuurlijke informatiekunde, Rijksuniversiteit Groningen

Facilitating Innovation

An Action-Oriented Approach and Participatory Methodology to Improve Innovative Social Practice in Agriculture

Paul G.H. Engel

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To Gerda, Henk, María, Laura and Karen

Contents

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A study based on case studies and participatory action-research makes it difficult to do justice to all those who have, wittingly or unwittingly, contributed to its development. Of course, where possible I have cited each contribution specifically in the text. However, there are some people who made such an impact that even many references are not enough. Niels Röling, the great facilitator, makes it all happen without anyone even noticing it. Without his support this book would probably not have materialized. Joe Ascroft taught me that in development not only science matters but art and craft as well. Anne van den Ban showed me intervention could be studied scientifically. Wim Tacken and A.P. Verkaik showed confidence something useful would come out of it. Norman Long had his doubts, yet encouraged me to go on. John Simons' strong logic and precision were extremely stimulating. Most of all, my Chilean friends and colleagues taught me the real meaning and the strength of a 'soft system'.

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There is simply no space here to list all of those, researchers and students, who brought their energy and enthusiasm to the cause of further developing knowledge systems thinking and RAAKS. I refer to those I am aware of in the text. Also, the contributions made by (post)graduate students have been included in a special annex. Lastly, none of this would have ever been possible without the strong support I received from my family and close friends. María, Laura and Karen demonstrated what care and mutual support may accomplish. Of course, despite so many valuable contributions, any misrepresentations or skewed interpretations remain my own responsibility entirely.

1. *Problem definition, research purpose and design*

1.1 Introduction: knowledge, technology, innovation

One of the issues which has intrigued me since starting to work in rural and agricultural development is why certain technological innovations spread like wild-fire, while others do not spread at all, even when pushed very hard. In addition, it seems, certain situations, or combinations of events, seem to invite the players in rural 'theatres' to actively search for change and implement new ideas very quickly, whilst others appear to give rise to defensive attitudes, and the blockage of new ideas being implemented. It was no coincidence, therefore, that I started systematic inquiry into this field by scrutinizing the earliest attempt to find answers to such questions: the *diffusion of innovations* theory, developed by Everett M. Rogers and others during the sixties (Rogers and Shoemaker, 1971).

Now, in the nineties, we are on the brink of a new agricultural era, where ecological sustainability, in addition to social justice, has been recognized as a requirement for agricultural development. The result is a world-wide debate on the type of technology we need to face this new challenge. And the only thing we know for sure is that the technologies we have at our disposal right now are not enough for sustaining agricultural development into the next century. One of the interesting aspects in this debate is that of 'manageability': can we actually 'steer' technology development into a specific direction, even if we would know which direction this would have to be?

After World War II, both the 'scientifization' (Van der Ploeg, 1987) and industrialization of agricultural production have reached unprecedented levels. Its impact is increasingly global, both with respect to its positive and its negative consequences. The negative consequences, however, are the ones which oblige us to think more thoroughly about the manageability of technology development and innovation. The irreversible deterioration of eco-systems in many parts of the world, the unsolved social disruptions associated with agricultural rationalization, and the resource limitations of our planet earth, all force us to reflect upon the adequacy of current technological developments in view of long term objectives like ecological sustainability and social justice.

In this study, I want to argue that one of the main problems hampering the development of sustainable solutions in agriculture today, is the one-sidedness of our social and institutional learning processes. In spite of our attempts to understand innovation processes in agriculture, our theories and practices promote linear and exclusive ways of thinking, and uni-dimensional 'rationalization', rather than empowering us to apply multiple rationalities to learn to adapt ourselves effectively to rapidly changing circumstances. I will argue, that such empowerment can be seen and dealt with as a 'management problem'. Social and institutional learning processes can be understood and managed

in such a way as to enhance, rather than frustrate, innovative thinking and multi-facetted development. To achieve this, we have to recognize knowledge as a vital resource and take up its management actively.

1.2 General approach & methodology

To address this issue I first developed a minimum package of theoretical concepts in 1986 to help study social and institutional learning in agriculture. Equipped with this package, I embarked upon case studies and practical exercises with professionals in agricultural development to further explore ways of analysing and understanding social and institutional learning for agricultural development. This 'Odyssey' through a great variety of countries and agricultural development situations, generating an active input of numerous colleagues along the way, produced a number of perspectives which I believe to be useful to the analysis of social and institutional learning in practice.

During the same period, various schools of academic thought converged on studying related issues. As a consequence, theoretical developments have accelerated during the last 10-15 years. To make my argument, I may now draw upon the work of scientists from many different disciplinary backgrounds. Economists developed a contingency approach to 'induced innovation'(Hayami & Ruttan, 1985). Sociologists and communication scientists perfected the theory of 'diffusion of innovations' (Rogers & Kincaid, 1981; Rogers, 1983). Social and technical scientists collaborated in developing the 'Agricultural Knowledge/Technology Systems' (Beal et al., 1986; Swanson, 1986; Röling, 1988), and 'Farmers First' approaches (Chambers et al., 1989). My transfer, in 1988, to the Department of Communication and Innovation Studies (formerly: Extension Science Department) at Wageningen University - where one of these schools of thought is housed - made it possible for me to 'plug into' these developments, and to enrich my action-research with it.

One thing I soon found out is that knowledge management is necessarily a collective, social effort. Knowledge is no 'commodity' in the traditional meaning of the word, it is constructed socially (Long, 1989; Long & Long, 1992). Hence its 'management' is to be social as well. Of course, this I knew from my experience in agricultural development projects in Africa and Latin America: no matter how solid we feel our technical recommendations are, if adoption occurs at all it is because farmers interactively reconstruct their practices in their own particular way, according their own social, economic and cultural standards. However, this basic lesson was very much confirmed during my case studies in The Netherlands: no single person can hope to enhance social and institutional learning on his or her own. Single managers can have a decisive influence, but they always depend upon others, Government officials, colleagues, employees or even complete outsiders, to make it work. If the construction of knowledge is a social process, then its management is as well.

This lesson has influenced my research fundamentally. It made me look for a *participatory approach* to the analysis, and management of what people do when they generate, exchange, and use knowledge and information. Again, major developments in other fields of research provided me with powerful support to underscore this point. During the late

eighties, on the one hand development sociologists focused their attention upon knowledge and networks. From an 'actor-oriented' perspective, Long (1989) called attention to the power of individual social actors to make sense out of their situation, and to develop strategies to deal with them. Box (1990) studied the use of social networks for generating and transforming knowledge, arguing the relevance of 'knowledge networks' for agricultural development. Management science (Moss-Kanter, 1983, 1989) produced a number of relevant studies, putting up a convincing argument for sharing responsibilities as far as innovation management is concerned, rather than 'directing' innovation from the top. Key words in the management of innovation became 'facilitation', 'creativity', 'decentralization', 'team building', etc. It was also in management science, that a major breakthrough was made in thinking about participatory approaches to revitalizing organizations: the 'soft systems methodology' by Checkland cs. (Checkland & Scholes, 1990). Its application and development for agricultural and resource management was taken up at Hawkesbury (Sriskandarajah, Bawden & Packham, 1989; Bawden, 1990, 1991; Wilson & Morren Jr., 1990; Bawden & Macadam, 1991).

Given the need for a participatory approach to knowledge management, a logical next step was to incorporate 'soft systems thinking' into my approach. In my view, it had significant contributions to make to traditional participatory approaches which often fail to involve both owners and victims of problems in the conceptualization of the problem situation, and in the development of solutions. Eventually, I decided to concentrate my efforts upon this latter part of knowledge management: the sense-making effort or definition of problem situations, and the identification of possible solution strategies. The first reason is a logical one: one has to start from the beginning, and get to know the problem first. The second reason, however, was pressed upon me during my research.

The management of knowledge as a resource is difficult because it is not generally perceived as an 'issue'. People may be suffering the consequences of bad management of knowledge processes almost daily without taking this as an argument to look into 'knowledge management'. In practice opinions vary from a strong conviction that you should or can nor do anything about it to individual strategies aiming at increased individual benefits from the acquisition of knowledge. The management of knowledge is not yet seen as a promising theatre for joint, purposive effort. Therefore, I decided that my first aim should be to try to define this field of activities and to develop an approach to making it visible and understandable and hence, more manageable to those concerned. Also, I would like to contribute in designing conceptual and methodological instruments to help stakeholders improve their performance.

With this, the main purpose of my research has been established. I will be happy if my research contributes to increased insight by those people involved in knowledge-related problem situations. If I may suggest ways of improving knowledge management in practical situations, I will be even happier. Given the necessarily active role of stakeholders in such an endeavour, my aim will be to develop a participatory approach and methodology to facilitate the design of useful actions and/or interventions to improve social learning.

1.3 What can you expect from this book?

A book like this does not pretend to provide definite answers, yet it will raise many questions. It provides a cross-section of a continuous research effort at a certain point in time. It reflects the point I arrived at through my 'research-in-action' in 1992, 17 years after writing my first thesis on technical innovation in agriculture, and 6 years after presenting my first draft proposal for PhD research to my supervisor. In the meantime, I have been working as an extension worker, as a field researcher, as an agricultural development manager, programme director, trainer, and as a university lecturer. A large number of farmers, co-workers, friends, bosses, teachers, students and academic colleagues has contributed to my intellectual development. A large number of case studies, both part of the ISNAR Research/Transfer Linkages Study Project and the Central American Basic Grains Project, and case studies by undergraduate students of the Communication and Innovation Studies Department added an empirical dimension to it. During the writing, I will try to be as explicit as I possibly can in recognizing everyone's contribution.

I intend to keep the book as practical as possible. As a practitioner as well as an academician I learned two things which I try to keep very much in mind. One is the need to be concise if one aims at reaching the ones that really matter. And the second is that it is not theory or abstract thinking which makes managers and practitioners shy away from books, but irrelevance to their daily work. As my predominant intention is to argue the relevance of a knowledge management orientation in our daily work, I will have to take up such a challenge head on and attempt to provide a hands-on methodology.

My practical experience had taught me that knowledge management could not be separated from 'social and institutional learning'. The management of knowledge should be studied in a social context, not as an individual effort only. This caused my first main problem: how to present such a rich knowledge base on such an all-encompassing theme. Obviously, in the beginning, not even the object of my study was very well defined. In fact, when I started, not even a documented research design existed. Only an ill-defined, badly structured notion of a problem. A situation which, as we will see, very characteristically requires a solid 'injection' of knowledge management expertise. This I didn't have (yet?). Eventually, I decided to stick to my personal intellectual development path as far as I possibly could without boring the reader with too many of the details of the struggle. I considered this would do justice to the exploratory approach chosen in this research and to the roots of my intellectual development which reside in my daily practice.

As a result, this book will address the following issues. First, I will briefly indicate the history of my research proposal, its justification and purpose and the approach I eventually implemented to try answering my research questions (this chapter). In chapter two I will argue my choice of perspective and elaborate upon the methodological and theoretical approach I use to make sense of my inquiries into processes of social and institutional learning in practical situations. In chapters three to six I present and discuss the results of the case studies which guided my search for useful ways of analysing problem situations 'in situ'. In chapter seven I draw the conceptual lessons from the case studies and, with the help of additional theoretical inputs, outline the foundation of what I

see as an empirically based, conceptually coherent and at the same time, practical approach to understanding the social organization of innovation in complex, social situations. In chapter eight I subsequently ask myself whether useful interventions in such situations are indeed conceivable and I develop a number of criteria an effective methodology would have to meet in order for me to label it as useful. In the same chapter, I introduce my answer to the challenge of designing useful interventions to enhance innovative performance: RAAKS (Rapid Appraisal of Agricultural Knowledge Systems), a participatory action-research methodology for studying innovation-related problem situations and for designing possible courses of action. Chapter nine reviews a number of initial experiences with RAAKS in practice and offers a preliminary discussion of its relevance and applicability to development practice. Lessons are drawn with regard to its use by different actors under different circumstances. Finally, in chapter ten I look back and reflect upon the relevance of my study for understanding and managing knowledge and innovation processes in complex, ill-defined situations.

1.4 The context: current institutional arrangements under siege

During the last two centuries, the agricultural innovation process has been progressively institutionalized. Government, semi-government, as well as private institutions have been created, such as agricultural ministries, universities, research stations, extension agencies, and industrial R&D departments. All in all, societies have invested considerably in creating complex institutional arrangements for the sake of advancing technological innovation in agriculture. During the last twenty years, however, these institutional formations have come under scrutiny. Degradation of natural resources and adverse social, economic and environmental effects were increasingly associated with 'modern' agricultural development. During the 1980ies this has caused the very nature of the institutional arrangement which supports agricultural innovation to be called into question. Asked the environmentalists in The Netherlands: Can we expect those institutions which successfully contributed to current problems of over-production and environmental degradation to play a role in fundamentally shifting their emphasis? So far their answer has generally be 'no'. In most developing countries, non-governmental organizations not only asked such questions, but started to provide alternatives to Government supported institutions.

Having achieved unprecedented levels in bulk production of food stuffs and primary materials and faced with the consequences of these strategies, nowadays our general focus has shifted: from increasing production only to the search of sustainable forms of agriculture also. However, these latter alternatives are required not only to contribute effectively to maintaining food security, but to serve a variety of other national and international interests as well. 'Sustainable' is often used to refer to such forms of agriculture which strike a complex balance between the optimum use of available resources, the ecological, social and economic demands and contemporary political objectives. Jan Pronk, the Dutch Minister of Development Cooperation, summarizes it as follows: "Achieving and maintaining sustainable agriculture has become one of the focal points, not only within Dutch agricultural and environmental policies, but also within those of the international development community. Until now, agricultural policies - whether oriented toward export production or local food production - have focused too narrowly on maximising

short-term profits rather than on long-term sustainable management of local resources by farmers." (Reijntjes et al., 1992: xiii) As a result, new institutions, such as private and non-governmental agencies, and new institutional arrangements, such as farming systems research/extension teams and networks, have evolved, while traditional institutions are called upon to adjust themselves or to face obsolescence and disappear. Privatization, cost effectiveness, internationalization, user and market orientation are just a few issues reflecting the challenges facing agricultural institutions today.

As a consequence, policy makers and professionals in agriculture have taken up the *social organization* of innovation in agriculture as an area of reflection and discourse. New institutional designs, new ways of organizing and financing agencies, hands-off policies, contract management and market control are some of the 'buzz words'. Increasingly, non-agricultural parties seek to participate in the debate as well: environmentalists, consumer groups, animal health activists and nature and wild-life lobbyists. Not only as tax-payers, but also because of the evident effects of agricultural development upon society as a whole. With this, the social organization of agricultural innovation has become an arena for major policy debates. In such debates, different models are used to contemplate and construct the use of knowledge in society. Such models, as we will see, are of great consequence to the way innovation processes are organized, managed and, hence, to the direction innovation takes.

Sustainability and social organization

Ecological sustainability is widely recognized as the number one issue in agricultural development today. In many countries, the degradation of natural resources and the environmental problems associated with 'modern' agriculture have helped to put it firmly on the agenda. However, we definitely can't point at technology alone as the sole culprit of what is wrong with agriculture today. Sustainable technologies are a necessary, yet no sufficient condition for sustainable agricultural development. As is painfully evident from the various war-ridden territories in the world today, sustainable development can only be achieved where and when people have worked out a way to live with each other.

Sustainability requires patterns of social relationships adequate to the needs of individuals and communities concerned. In this respect, Jan Pronk warns that "..sustainable agriculture can be realized only through the individual and collective activities of farmers and communities pursuing their own strategies to secure their livelihoods" (Reijntjes et al., 1992: xiii). Such patterns of social relationships are to include adequate institutional arrangements as well. We can't look at farmers only - or, for that matter, policy makers or researchers or development workers or even money lenders - to re-orient and reorganize innovation in agriculture. Sustainable solutions will have to involve the lot of them. In order to achieve sustainable agriculture, not only has the social organization of agricultural innovation to be adequate, it has to be sustainable as well.

Facilitating innovation for sustainability?

If we accept the social organization of agricultural innovation is a relevant policy issue and in addition, that a focus on sustainability may help us define a set of criteria for evaluating its effectiveness, the next question concerns intervention. Can the 'social organization of agricultural innovation' be subjected at all to purposive intervention with any hope of achieving social and ecological sustainability? Or is what we perceive as

innovation merely the accidental outcome of an uncontrolled and uncontrollable series of events?

Given the historical character of the current institutional arrangements for enhancing agricultural innovation, my preliminary answer to this question is 'yes, it can'. However, it must be clear from the beginning that I entertain no illusions whatsoever as to achieving full control over it. The social organization of innovation for agricultural production is 'social' in the sense that it emerges from diffuse, social interactions among many different actors. Its results may largely be due to the unintended consequences of such interactions. Managing agricultural innovation processes, therefore, means *facilitation*, creating favourable conditions for innovation to occur. Here, I find myself in good company. Before me, several authors in management science seem to have arrived at the same conclusion as to the management of innovation processes in large industrial companies (see for example: Moss-Kanter, 1983, 1989).

1.5 The domain of study: theatres of agricultural innovation

If we recognize, as Winograd and Flores put it, that "...we're situated in a world that is not of our own making...", yet reject the rationalistic notion of ".. the existence of 'things' that are bearers of properties independently of interpretation.. " (Winograd & Flores, 1986: 73), we can not define our 'object of study' in the traditional meaning of the word. The domain of our studies may only *arise in our concernful activities*. In other words, we ourselves create our 'object of studies' by applying our distinctions to events and ideas we perceive. Yet even if it doesn't exist in the traditional sense, we still focus our studies upon a certain events and ideas, and not others. And such a choice and the basic distinctions we make, are motivated by our notions of what is relevant and what is interesting about the situation at hand. Therefore, to describe the domain of my interest I looked for a metaphor which accommodates some of the vital notions which guide my interest and approach to the topics of this research.

My primary interest is with transformation processes in agriculture. As a phenomenon it fascinates me and it has done so for the last twenty years. What makes farmers change their ways? Why does one farmer farm one way, while his neighbour chooses a different way? Why does a farmer farm one way now, while labouring his fields differently the next time? In a way, these questions are recurrent elements in both my field practice and my studies. As a field worker and, later, as a manager of development efforts, it struck me time and again: people are never static and not one person changes in the same way as another; individual and social learning and the diversities it helps generate are fundamental aspects of social life I have become very interested in.

However, there were other recurrent elements. In development projects, it was not simply change that interested me, but intentional change or development as a result of planned intervention. True to the classical dictum "if you want to know the world, try to change it", I actively engaged in efforts to create meaningful changes. As a result, time and time

again I was struck by the powers of human agency[1] and sense-making. Both in the positive sense, as when the farm population in the Sahel overcomes yet another period of severe droughts and starvation, maintaining its cultural identity and dignity in tact, and in the negative, as when a beef factory is built in a place where hardly a cow is available to the factory so that it has to import frozen beef in order to function as a factory for a few weeks per year.

The last recurrent element was multiplicity. So many social actors - people, institutions, organizations, companies, agencies - one way or the other are engaged in agricultural innovation at any one moment in time. Often, the result strikes an observer as a 'cacophony' of opinions, actions and events, the eventual outcome of which somebody calls 'innovation'. Still, patterns emerge and actors use them to their advantage. In short, strategizing and improvisation, coalitions and break ups, life long partnerships and 'a quick one', nothing human seems unthinkable in agricultural innovation.

The metaphor I looked for to refer to this field of study, therefore, had to accommodate the above elements naturally. It had to accommodate individual growth & diversity, agency and sense-making, and multiplicity and strategizing. Eventually I settled upon the word theatre. I got used to refer to my domain of study as *complex theatres of innovation in agriculture*. Theatres are places where partly pre-meditated, partly improvised actions are performed. Directors, managers, designers, stage builders, actors and audience interact intensively to produce both structure and serendipity[2]. It also emphasizes the socially constructed context to human behaviour. The actions are not only discursive yet discourse plays a very important role. Many actions are 'dramatized' in order to increase their impact. Such dramatizing by the actors, of course, requires considerable skills. Therefore, physically speaking, theatres are places where people face personal and collective challenges they try to cope with, initially without knowing whether or not their efforts might eventually be 'succesful' in the eyes of their audiences and critics. In 'theatres of war' this physical challenge acquires a new, fatal dimension. Mentally speaking, theatres are learning environments, which may stimulate personal growth of both actors and audience through acting, looking, listening, feeling and reflecting upon it.

A student of theatre may take up a position in the back row, quietly observing what is going on, or might fully engage in the play as an active member of the public or even as a stage actor. I, as a student of theatres of agricultural innovation, held all three positions for prolonged periods of time over the last 17 years. Moreover, as a metaphor I prefer the concept of a theatre as opposed to 'arena' or 'system', to try to avoid - at least initially - an explicit 'a priori' reference to either 'struggle' or 'harmony'.

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[1] Here, I use the term 'agency' in its general sense; later on, in chapter 2, I will use it in its sociological meaning, the way Long and Giddens define it.

[2] I owe this concise description of what 'theatre' means to a personal comment by Frank Vanclay.

1.6 The purpose of my study

The purpose of my study of theatres of agricultural innovation is to understand better the *social organization of innovation*: How do different actors, or parties involved, organize themselves in order to achieve agricultural innovation? What do they actually do? And to what extent may we attribute what actually happens to the way in which the actors organized themselves and their individual or collective actions? Eventually, I would like to ask myself which of the actions were most relevant to achieving the changes observed? Clearly, I take innovation to mean *'change-on-purpose'*, propelled by individual and collective intentions. However, given the discussions in the previous paragraphs, the reader may not expect me to believe in a straightforward causal sort of relationship between intentions and effects. To the contrary, my field experience and studies have convinced me that even searching for a simple causal relationship between what actors *intend to do* and *what they do* is problematic, let alone between what they intend to do and *what the eventual results are*. No two presentations of a play are the same, no matter what the intentions were. There might however be a pattern somewhere: if a play has been successful in the eyes of initial audiences and critics, its chances to fail later on are definitely reduced. My first step will be to search for such patterns, to explore them and hold them to empirical light.

I consider this study very much an exploratory one. I have two reasons for this. The first is a practical one. The study of the social organization of innovation in agriculture is relatively new. Important progress has been made since the Lionberger & Chang postulated the 'science-practice continuum' in 1970. Fundamentally, since that period, little has changed. Most authors remained within the narrow limits of 'linear thinking' about the role of science and technology in society (Röling, 1993). During the eighties, the public and policy debate has shifted considerably: the role of science is questioned, technological solutions are not seen as the only possible cures any more, and social problem solving has become an important issue. From such a perspective, if we look at what applied science has to offer to support an effective public and/or policy debate on issues concerning the social organization of technological innovation in agriculture, we must recognize that this is rather limited. Scientific thought with regard to the social organization of innovation has to meet the challenge of the diffuse, complex social as well as technological phenomena perceived as issues in the nineties.

The second reason is a more personal one. It has to do with my intention of providing conceptual tools and methods to practitioners. In the same way Checkland & Scholes (1990) concluded for industrial organizations, I don't think the ill-defined problems situations we are dealing with in theatres of agricultural innovation 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" (Concise Oxford Dictionary; Fowler et al., 1964). And I am not sure it is even a good idea to try. What we, practitioners of agricultural innovation, need is ".. a coherent intellectual framework (....), as *an epistemology* which can be used to try to understand and intervene usefully in the rich and surprising flux of everyday situations" (Checkland & Scholes, 1990: 24).

I may now define in a more specific manner the purposes I have in mind with this study. The more general purpose is to enhance my understanding of the social organization of

innovation in agriculture and of possible ways to improve its effectiveness. This in turn should make it possible for me, first, to contribute to developing a coherent conceptual framework that helps students and practitioners to engage in meaningful discourse about it, and secondly, to suggest a practical approach towards enhancing innovation processes in practical situations. I hope, the beneficiaries of this study will be those engaged in managing and facilitating agricultural development. I consider their task one of the most fascinating ones there is.

1.7 Research questions and expected results

It would be preposterous to state that a consistent set of research questions has guided my research during these years. Rather, many questions surged during my quest for understanding, most of which were abandoned further along the line whereas only some survived. In this book I will concentrate on answering the latter ones. These, for transparency's sake, I have grouped into two distinct yet intertwined lines of inquiry. The first I call my *exploratory path*. Strolling along this path I am concerned with enhancing our understanding of the social organization of innovation through empirical research. It originates from the first purpose of my study as outlined in 1.6 and is a search for useful perspectives to conceptualize, probe and study this diffuse, multi-facetted phenomenon. The milestones along this path are chapters two to seven. The second line of inquiry I see as a *design path*. Its origin is the second purpose of this study. By choosing to walk this path I accepted the challenge of designing and testing a methodology for contributing to the facilitation of innovation processes in complex agricultural theatres. Its milestones are chapter two, eight and nine. Both paths cross each other frequently along the way: the reflections on useful analytical perspectives serve the design of the methodology, whilst the experiences with and reflections upon experimental action as part of design contribute to clarify my explorations. Still, both paths serve a distinct set of research questions (see box 1).

Q1. How do different actors or parties organize themselves in order to achieve agricultural innovation?
Q2. What do they actually do, in order to achieve the transformations they aim at?
Q3. What criteria should an action-oriented methodology meet in order to be able to contribute to facilitating innovation in agriculture?
Q4. Can a practical methodology be designed along the lines specified above?
Q5. What are its potentials and limitations in practice?

Box 1: Five research questions to guide this inquiry

The exploratory path is concerned mostly with the questions *Q1* and *Q2*. The design path directs itself to answering the questions *Q3* to *Q5*. Intentionally, I formulated my research questions in an open-ended, comprehensive sense. My inquiry was an exploratory one, I started it with an open mind. During three subsequent learning cycles (see figure 1 above) I progressively found reason to further delimit my inquiry, whilst I obtained a better idea of what my answers were going to be. The book reflects this. Chapter two provides a general perspective yet the case studies in chapter three to six spread out into a number of

different directions. In chapter seven I pull most of these strings together again conceptually and attempt to bring my exploratory path to a close by answering research questions *Q1* and *Q2*. Then, in chapter eight and nine I take up designing again from where I left it in chapter two. In order to answer questions *Q4* and *Q5* I knew no better way than to actually propose a methodology along the lines proposed and see whether it works. The answer to research question *Q3* at the beginning of chapter eight can be seen as the linking pin between the exploratory and the design path: it specifies criteria a methodology should meet on the basis of the empirical research that preceded it.

Clearly, my intention is to study innovation as a *process*, emerging from and at the same time helping to shape social (inter)action. As such, I take innovation to be a *historical* phenomenon. Innovation in agriculture is socially wrought between a variety of actors who are, one way or the other, *stakeholders* in the process. Also, admittedly these five questions are too large to handle exhaustively in one study. I will not search for any definite answers. But I will try to formulate specific, articulated and useful ones. My intention is to offer the 'end products' as specified below (box 2).

R1. A significant contribution towards designing a coherent and empirically validated *conceptual framework* to facilitate a critical analysis of the social organization of innovation in agriculture and its management: towards *appreciative systems thinking*.

R2. A set of valid and applicable *windows* or analytical perspectives to enable researchers and practitioners to gather and process relevant information for qualitative research into the social organization of innovation in agriculture.

R3. A field-tested *methodology* to guide a process of participatory inquiry into the social organization of innovation in agriculture leading to the identification of relevant actors and useful interventions to improve it: *RAAKS, a participatory action-research methodology to improve innovative social practice in agriculture.*

Box 2: Intended results of this study

Yet, I am fully aware of the fact that, given the complexities involved in agricultural innovation as a historical process, the study will generate more questions than answers anyway. Therefore, the theoretical framework and methodological approach will remain 'unfinished'. To me, this is as obvious as it is a virtue. It corresponds to trying to come to grips with the complexities of daily practice, without pretending to ever fully achieve it. In this respect, my study is a typical example of action-research or, if you prefer, 'R&D'.

1.8 The research approach

This study aims at designing a *conceptual framework* which enables us to perceive and contemplate events and ideas in a coherent manner, rather than at formulating an 'objective' account of the essence of innovation in agriculture. As such, it aims at providing useful perspectives to try to understand complex theatres of agricultural innovation and to help design effective interventions or management practices. Therefore, one of may main objectives is to allow for as high a level as possible of integration of theory and practice. As a result, this book represents an account of *reflected practice* as well as *practiced reflection*. I would like to look at my own experiential learning process (Kolb, 1984) as a continuous series of learning cycles which have naturally evolved within the context of my professional life.

The methodological approach I chose to achieve this is essentially *qualitative*, but even more than that: *reflexive*. My own experiences as a development professional are both a starting-point and a permanent reference. Initially, so many questions had remained unsolved in my mind that I was motivated to dedicate considerable time in my life to looking for answers. Of course, the more I looked the more questions arose but I got some answers too. Or rather, I found some ways to look for answers more systematically. A general question I want to answer in this book is whether these insights are relevant beyond the immediate context of my own work and whether they can be of use to other reflexive practitioners.

Therefore my research account is empirically anchored in two different ways. First, it is grounded in my own practice as a professional. At every step of the way, I couldn't help but ask myself: What would I have done differently, knowing what I think I know now? This is the part less specifically addressed in this book. Besides the fact I consider such an account rather boring stuff to read, I'm sure any reader will ask him or herself this same question all the time. And I'm convinced only his or her own answer is what counts in practice. Secondly, the research has benefitted from the applied scientific inquiries which increasingly became part of my professional life. Particularly after having joined the Communication & Innovation Studies Department of Wageningen University, I have been able to take an active part in a number of research projects which provided me with an opportunity to develop my ideas more systematically and to put them into practice both as a researcher and as a consultant. The empirical materials for this book originate from these inquiries. It represents an effort to document and integrate these diverse experiences.

Of course, both strands of experience were generated in intensive and often emotional interactions with many bright and committed people who shared and added to my questions, yet didn't pretend to have all the answers either. I have been fortunate to encounter so many colleagues willing to encourage and pay critical attention to my professional development. It will be practically impossible to recognize all of their contributions adequately. Yet I'm very much aware of the fact that, as usual in accounts of reflexive *practice*, the product is a collective rather than an individual one.

In the following I will briefly and hence sketchily describe these two fundamental strands of personal experiences which underpin my research. My purpose with this description is

to give the reader a measure of insight into the empirical basis my research has benefitted from.

Reflexive professional practice

More often than not, I found myself performing roles I had never believed I was able to play. During many years I was so engulfed in practical field work that I hardly took the time to sit down and think. Still, I kept up a certain systematic evaluation routine which helped me to go slightly beyond daily events and to look for patterns. Inspired by Anne van den Ban and Niels Röling of the Communication and Innovation Studies Department of Wageningen Agricultural University, I also engaged in research. Both in the 'Small Farmer Development Research Project' (1975-1979) at the IAC in Wageningen and during a field study of the impact of agricultural extension in Tarapoto, Perú, in 1976-77, I was able to gather some research experience of my own and learn how to go about my reflective activities in a more systematic way.

However, it were my jobs as an interim manager of the Small-Scale Irrigation Development Division of URADEP, Upper Region Ghana (1979-1980) and as a project manager in Pasto, Colombia (1982-1985), which really introduced me to the dynamics of human agency in development theatres. Thanks to Joe Ascrofts' vivid demonstrations of, and lectures on human agency and discourse, the first experience was a real apprenticeship. He taught me to mind "the art, craft *and* science" of communication for development. The latter job I took up after having participated in the project as an extension communication specialist, doing both applied research to improve the design of our communicative interventions and participating in the implementation and evaluation as well. Eventually, it included writing and editing the final summary report on ten years of project intervention in the Nariño Highlands. It provided me with an opportunity to study trends and developments, also for those periods in which I had not been involved in the project. During this period, progressively I was able to put down in writing more of my experiences and thoughts. Although mostly unpublished, these reports and articles reflect accurately my *praxis* at the time, and they provide me with varied reference materials when needed.

As a programme manager for the Netherlands' Ministry of Agriculture and Fisheries' International Extension Programme (1985-1988) I had the opportunity to participate fully in the development and implementation of the International Course on Rural Extension (Knowledge Systems & Management), at the IAC in Wageningen. Here, with Bertus Haverkort, Eine van Dissel, and, again, Niels Röling, conceptual inquiry and methodological design and practice went hand in hand. It was the first time I experienced the power of *reflected practice*, from the reactions of the experienced colleagues from all over the world who participated in our courses.

My subsequent transfer to the Communication and Innovation Studies Department (formerly: Extension Science) at Wageningen Agricultural University, was another logical step made possible by the confidence of those colleagues who shared my belief that reflected practice is a healthy basis for applied science. In the meantime, I had taken up an assignment with ISNAR to participate in their Research/Technology Transfer Linkages Study, as a researcher and core group member, and had an opportunity to look into the 'kitchen of agricultural research management' in The Netherlands through a temporary

detachment with the Secretariat of the National Council for Agricultural Research, headed by A.P. Verkaik.

Applied scientific inquiry

The scientific inquiry behind this study is of the exploratory kind. Even when in a few cases quantitative images were used, these served a descriptive, analytical purpose and not a conclusive one. The inquiry started out as ill-defined as the agricultural innovation theatres I participated in. My first formal research proposal (October 1987) looked like a "..programme proposal for a research institute rather than a research project for Ph.D. research" (pers.comment A.P. Verkaik). However, it laid the groundwork for doing case studies in order to develop more systematic ideas related to knowledge management. Together with other early reflections, it also provided an initial framework, a starting-point for several learning loops to come.

When I started participating in the ISNAR R/TT Linkages Study and shared with David Kaimowitz, project director, and Monteze Schneider, consultant, the responsibility to develop a theoretical approach to studying the links between agricultural research and technology transfer in developing countries (Kaimowitz et al., 1990). This provided me with an opportunity to do a first, leading case study in the Nariño Highlands, Colombia (Engel, 1989, 1990). It served as a basis for writing chapter four and part of chapter five of this book. Another leading case study was done by David Kaimowitz (1989). In the same group we elaborated a research methodology for more case studies to be done by national research teams (Engel et al., 1989). As a result, a total of 20 case studies were eventually done in seven developing countries (see Annex 1). Two scientific seminars with a group of internationally renowned scientists covered both the conceptual and the methodological side of these studies and contributed greatly to our grasp of the key issues. Among the synthesis papers commissioned by ISNAR was the one I wrote with Stephan Seegers. The empirical evidence quoted and conclusions drawn were discussed in detail during the ISNAR seminar with the national research teams in 1990. Many useful comments were later worked into the paper. Chapter five of this book is based on its final version (Engel and Seegers, 1992).

In the meantime, in the Netherlands I was able to participate in the working group on 'knowledge management' of the Ministry of Agriculture and Fisheries, headed by Dr. A. Meijering. Its task was to design a systematic and automated approach to the management of knowledge and information about agriculture. This led to a case study with the District Extension Office at Tilburg, in the province of Noord Brabant (Engel, 1989). Complementary opportunities for conceptual and methodological development were provided through our research with AGROCOM (Engel, 1992). These studies provided the material for studying communication networks in agriculture (chapter three). Furthermore, extensive field research on the introduction of solar energy and the solution of transport problems in the Netherlands, commissioned by NOVEM, taught us the meaning of communication and collective sense making for social and institutional learning (Engel & Den Bakker, 1992; Den Bakker et al. 1993). Finally, my participation in the development of 'participatory technology development' as an approach to developing sustainable agricultural solutions led to ILEIA providing me with the case study materials on networking for innovation among non-governmental development organizations in developing countries that form the basis for chapter six.

The experiences with the Ministry of Agriculture staff led me to a first design of what was to become the RAAKS methodology, a rapid appraisal method for studying and debating interventions in agricultural innovation theatres 'in situ'. In 1990 we were provided with a first opportunity to test the design in the horse sector in the Netherlands (Engel et al., 1990). This lead to a tentative edition of the RAAKS manual (Engel et al., 1991). Then, in 1992 PRIAG, the IICA/EEC supported basic grains development project in Central America, provided us with the opportunity to train research and extension professionals from 6 different Central American countries in the use of RAAKS in order to help them analyze local learning processes with respect to basic grains production in their respective areas. This resulted in a total of 14 RAAKS case studies in Guatamala, El Salvador, Panamá, Costa Rica, Nicaragua and Honduras. Afterwards, a systematic evaluation of the use of RAAKS as a methodology was done. An entire day was reserved during the Regional MSICA II Seminar in October 1992 for the national teams to evaluate their experiences and to elaborate their conclusions using an open-ended questionnaire. The conclusions were reported orally and discussed with us at the end of the day. Written reports per team were also submitted. This evaluation provided us with many clues to start working on a more definitive version of RAAKS, as a participatory action-research methodology for analysing local and institutional learning processes in practical situations (Engel & Salomon, 1994). A more detailed description of the formative experiences which led to the RAAKS design and its preliminary results are reported in chapters eight and nine. The evaluation of RAAKS by the field researchers in Central America represents the 'finish line' for the research reported here.

This way, the book covers two research cycles, I and II, and three complete learning cycles a, b and c between 1987 and 1994 (figure 1). These may be summarized as follows:

1987 - 1990: the conceptual and methodological struggles involved with the preparation and implementation of a series of ISNAR RTTL case studies (I). To me, this represented a 'broad side' approach into studying the social organization of innovation, very open-minded and particularly useful in order to achieve a complete learning cycle which affected profoundly the way I thought about theoretical approaches, research methods and principles (a);

1989 - 1993: an action-oriented research process directed at the development of RAAKS, including (partial) implementations by students, workshops and comprehensive case studies in the field that culminated in the experimental use of RAAKS in six Central American countries (II). A synthesis of five case studies on networking for sustainable agriculture, an opportunity offered to me by ILEIA, further enriched this experience. During this period theory and methodology were confronted with each

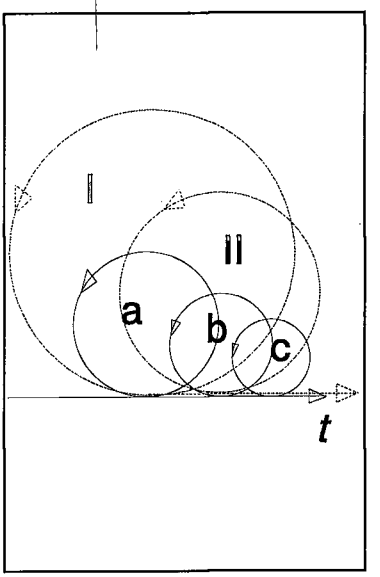

Figure 1: Cycles of research (I,II) and learning (a,b,c) 1987-1994.

other permanently and were eventually merged into a coherent methodological approach. This I consider represented my second full learning cycle (b).

1993 - 1994: the write up of this book took me around one more time, trying to make sense out of a complex and extremely rich experience. It brought me into contact with new empirical materials on networking and some recent, and at least to me hitherto unknown theoretical approaches which helped me to suggest a consistent conceptual framework as an answer to the exploratory research questions I had asked myself (c).

Both initial cycles included initial field research of my own as well as independent field work by others. In the first cycle, as a core group member and consultant, my contribution to the methodological guidelines was significant. In the second, for better or for worse, it was dominant. Nevertheless, in both cycles, national research teams were autonomous in collecting and weighing relevant information and in writing up the research reports I used as a basis for my analysis. Also, in both cycles members of the national research teams and international colleagues contributed their independent judgements to my interpretation of the case study results. Therefore, I feel comfortable to argue that the explorations I present in this book, do not simply reflect a personal view but a well-probed and pondered interpretation of the issues and events we studied. For any misrepresentations of our outcomes while writing this book, of course, I have only myself to blame.

Predispositions that withstood the years

Notwithstanding the conceptual turmoil and methodological labyrinths which pushed me on, eventually I also identified a number of constants in my reflection which I consider relevant to mention here. One may call these 'biases'. I prefer to call them predispositions. They represent a number of points of departure or anchor stones, which in spite of heavy weather have not succumbed to drift. In the light of the exploratory and qualitative nature of this research, I consider it indispensable to make them as explicit as I can, before asking you to read any further. They are the following:

P1. Human ways are central to my interest. Why do people do the things they do the way they do them? This is the first question which always springs to my mind when studying a situation. Notwithstanding my original training as an irrigation agronomist this makes me, I guess, a social scientist. Both in professional and in academic terms, this is a very fundamental choice indeed, and maybe a 'species-centric' one (as in: 'ethnocentric').

P2. As a student of development early in my career I was lightning-struck by a remark from Solon Barraclough (1974): "Development is not just economics or sociology or technology but history". And it is the way we humans act and relate to each other that creates this history.

P3. Ecological sustainability is not only a natural resources problem. It is a human, or even better, social problem as well. Its achievement is intrinsically linked with the way we humans go about our daily lives. Our actions, and the type and level of social organization we achieve to coordinate these, fundamentally affect our chances of survival. Any concept of ecological sustainability therefore has to include a systematic notion of human 'agency' and its role in conceptualizing, achieving, maintaining, or alternatively, eliminating sustainable practices.

P4. Social and technological innovation go hand in hand. 'Technologies' stem from and also affect the way we act and think. Besides, if we accept that humans have the ability to reflect upon and learn from their experiences, social development, technological development and learning are intrinsically related.

P5. Collective human action is more than, and fundamentally different from the sum total of individual activities. However, one cannot be understood without the other.

P6. Understanding as a basis for designing useful practices is at the core of my commitment to research. Interesting ideas are important, but useful ideas have my preference.

1.9 The research methodology

In this section I will describe the general methodological issues so that the reader can assess the methods I have used to generate, organize and interpret the information I use in this study and hence, can judge the trustworthiness of my arguments. Naturally, the *exploratory path* required a different set of methods than the *design path*. I will refer to both separately. Additional details on the methodology are included in the respective chapters in which the results of the different research efforts are presented. At the end of this paragraph I will define the criteria I myself intend to use to judge the outcomes of this study.

The exploratory path

While travelling this path, my intentions were to identify and/or develop and probe perspectives different from the ones known to me in advance. I chose qualitative research methods as the basis for my inquiries. In the first place *case studies* (see box 3). In these I used semi-structured interviews with key informants, secondary (published and unpublished) sources and group interviews to generate and organize relevant information. Also, I was careful to systematically cross-check information between sources. My interpretations I systematically fed back to those interviewed, so that they could enrich my analysis with their observations and comment upon my interpretations. These comments, generally, provided me with reason to have another look at the way I weighed salient issues. They seldom forced me to recast my interpretations fundamentally. End results, by means of a written research report, were presented to those involved for a final check on details and to comment upon and discuss my/our interpretations of the ideas and events studied. As can be seen in box 3, chapters three, four and part of five are based upon case study materials.

In the second place, I synthesized available case studies to search for regularities relevant to my inquiry. Each of these studies consisted of a review of relevant literature and a thorough analysis of the case study materials available. The first I did focused on studying the effect of improved inter-institutional linkages on innovative impact. I took my own case study materials and analyzed them from this point of view (synthesis study 1). The results I again cross-checked with key informants in the area, who provided me with additional comments and insights. Also, I presented the preliminary report to an international workshop organized by ISNAR (November 1989; see Merrill-Sands & Kaimowitz, 1989), before finalizing my conclusions (Engel, 1990a). The results are presented in chapter four. The second synthesis study I did with Stephan Seegers. Here,

Empirical studies: #	Title	Author(s)	Countries	Year	Ch #
Case studies:					
1.	Peasant Technology Dev't	Engel	Colombia	1989	4,5
2.	Knowledge & Information Use by Farm Advisers	Engel	Netherlands	1989	3
3.	AGROCOM, study on farmers' information use	Van Dijk, Engel, Leeuwis	Netherlands	1990	3
4.	Knowledge and Information System Horse Sector	Engel, De Groot, Meijering, Eleveld	Netherlands	1990	9
Synthesis studies:					
1.	Impact of Interinstitutional Coordination	Engel	Colombia	1990	4
2.	Towards effective linkage strategies	Engel, Seegers	Colombia, Philippines, Nigeria, Ivory Coast, Tanzania, Dominican Rep., Costa Rica	1992	5
3.	Networking among NGDOs	Engel	Perú, West Africa, India	1993	6
Action-research evaluation study:					
1.	RAAKS in Central America	Engel, Solis, Moreno, & national research teams	Guatamala, El Salvador, Panama, Costa Rica, Nicaragua, Honduras	1993	9

Box 3: Empirical materials used in this study

we screened all 20 case studies done for the ISNAR RTT/L Study for patterns of interaction, leadership and coordination. Again, the preliminary results were cross-checked with the leaders of the research teams who had done the case studies. Our final results were presented and accepted by ISNAR (Engel and Seegers, 1992). Versions of this paper have been presented and discussed with colleagues during scientific workshops at Hohenheim, Germany, and Wageningen, the Netherlands (Engel and Seegers, 1991; Engel, 1993c). Chapter five is based upon the final results of this study.

The third and final synthesis study used in this book is the one concerning networking among non-governmental development organizations, commissioned to me by ILEIA,

Centre for Information on Low External Input and Sustainable Agriculture, Leusden, the Netherlands. They asked me to review and synthesize the lessons from self-evaluative case studies done by five different NGDO networks. Using a suggested format outlining the main questions to be answered, local researchers collected their materials and discussed their preliminary documents during a workshop in Sri Lanka in which all researchers and a number of outside specialists participated. In order to synthesize their experiences, I studied the final documents and invited comments upon my own interpretations from selected specialists who had participated in the workshop. The results were published together with the individual case studies (Engel, 1993b). They were also presented and discussed with the working group on agricultural extension at the 1993 European Rural Sociology Conference (Engel, 1993c). Chapter six of this book is based upon the final results of this study. The eventual organization, interpretation and integration of the results of the case and synthesis studies required additional literature review. This is reflected in chapter seven in which I propose answers to the research questions that guided my exploratory path.

The design path

The RAAKS design path can best be described as an intensive networking process during many years among many researchers and practitioners. It will be described at length in chapter eight (8.4). However, in order to anchor it empirically I included three distinct steps: the first was to field-test the first RAAKS design by means of a *case study* in the Horse Sector in the Netherlands (see box 3). The methodology and results of this participatory action-research are presented in chapter nine (9.2). The results obtained through semi-structured interviews with relevant stakeholders were discussed, consolidated and cross-checked with them during two consecutive workshops (Engel et al., 1990). The next step was a methodological *expert consultation* in 1991. During this meeting, four specialists were asked to relate their experiences with RAAKS or approaches similar to RAAKS, while another 15 were asked to contribute to the discussion of these and other relevant experiences that were brought forward. The consultation brought out a very rich picture of salient issues to be considered in the design and further development of RAAKS. They are presented and discussed in chapter eight. The third step was a full-fledged *experimental application* of RAAKS in six countries in Central America, leading to 14 different case studies in all, done by national research teams trained and guided by regional specialists. My own involvement in this effort was limited to training the teams and specialists and contributing to the synthesis of results by directing a workshop to that effect. During this latter workshop, a day was spent evaluating RAAKS on the basis of the experiences gathered by the national teams. The experiences with RAAKS in Central America and their evaluation on the part of the researchers who did the studies are presented and discussed in detail in chapter nine (9.3).

Over the years a large number of case studies by (post)graduate students of the Department of Communication and Innovation Studies added to the material available to support both the design and the exploratory path (see annex 2).

Assessment of outcomes
I intend to judge my outcomes (box 2) on the following accounts. The contributions to a conceptual framework I will seek to defend first and foremost by arguing their *usefulness* to development professionals and researchers to scout complex theatres of agricultural innovation and design worthwhile interventions. This is consistent with my intention to contribute to meaningful discourse and reflection rather than to an ontological explanation of the social organization of (technological) innovation in agriculture. Secondly, I will demonstrate the *internal consistency* of the approach I propose, *substantiate it* on the basis of my research and demonstrate its *foundation in current scientific thought*. Necessarily, my arguments will be built up throughout the book, but chapters two, seven and ten contain the main issues.

The windows, or analytical perspectives I intend to judge on the basis of their *use and applicability* on the one hand, and their *validity* on the other. In line with Suchman (1967: 120-121) I take validity to mean "...the degree to which any measure or procedure succeeds in doing what it purports to do". In as far as the windows are theoretical constructs designed to help achieve an understanding of the social organization of innovation processes, their validity mainly depends upon their effectiveness in bringing out relevant issues. For this I need to define what 'relevant issues' are when studying the social organization of innovation. This I intend to do when concluding my exploratory path in chapter seven. After that, I may evaluate each of the windows proposed for RAAKS in view of its contribution to highlighting these issues. My arguments with respect to the windows are summarized in chapter eight (8.6 and 8.7).

The methodology I will also defend first of all by demonstrating its *usefulness* to development professionals and researchers. In the second place, I will explore whether RAAKS does what it is designed to do. Following Checkland and Scholes (1990) I will refer to this as the *efficacy* of RAAKS. I will draw from my explorations a number of specific criteria by which a methodology of its kind should be measured and will evaluate RAAKS accordingly. Lastly, I will make a preliminary assess the actual *use and applicability* of the methodology under varying circumstances. The main arguments can be found in chapters eight and nine.

Finally, the most important argument will be the interest of the readers of this book which as yet I have no way of knowing.

1.10 The presentation of results - readers' guide

The formative experiences underlying this book can better be described as intertwined and partly overlapping learning cycles than as a sequence of steps. Even so, a book obliges one to offer the materials in a sequential way. However, I believe there exist several worthwhile routes to consume the menu offered here. In this last paragraph, let me suggest a few.

The first option is of course to follow the sequence of chapters as they appear in the book. This is the 'endurance option'. This route provides you with everything the author

is able to offer at this point in time. But there are other options. The 'executive option', for example, is to skip everything but chapter ten. You will then have a general idea of what has been done and of the main results of the study. The only thing you can do which takes even less time is to read the abstract and table of contents. However, such a 'traffic jam' option does not appeal to the author. For those who dispose of little time however and have some previous knowledge of the subject, the 'professional option' seems more advisable: one may glance through chapter one and two, skip three to six, read diagonally through chapter seven, eight and nine and read chapter ten thoroughly.

Also, there are options for those who do want to study the book but would like to do so from a more empirical, theoretical or, on the contrary, from a more practical angle. Each of these options should include reading (quickly) through chapter one. But then, the 'empiricist' might concentrate on chapters three to six and chapter nine, while the 'theorist' might focus on chapters two, seven, eight and ten. After reading chapter one, the 'activist' might decide to pass on to chapter eight and nine directly, reading chapter ten to acquire a taste of over-all content. Whatever the initial choice, the author definitely hopes it will motivate the reader to make the effort to read the rest as well.

Option:	*Read chapters:*
Endurance	1,2,3,4,5,6,7,8,9,10
Executive	10
Traffic jam	abstract, contents
Professional	(1,2),7,8,9,10
Empiricist	1,3,4,5,6,9,10
Theorist	1,2,7,8,(9),10
Activist	1,8,9,10

Box 4: Suggested options for reading this book....

2. *Diving into the deep: choosing a knowledge systems perspective*

"When the centipede was asked in which order he moved his hundred legs, he became paralysed and starved to death because he had never thought of it before and had left his legs to look after themselves" (Koestler, 1968:205).

2.1 Introduction

During the course of the study I often felt just like the centipede in Koestler's parable above. And indeed many argue the case that innovation processes are best left alone, not to be touched by the human hand. The 'invisible hand' of the (international) market mechanism will take care of it. I owe it to my close exposure and the intense experiences among deprived, and all too often misunderstood farm families in developing countries that I did not give up. Time and again they allowed me to participate in their search for relevant ways of innovating their agricultural practices. Their knowing actions provided me with an infinite source of inspiration as well as with frequent embarrassment at my own so-called technical notions. They never questioned the need for support, they did question its quality. In their eyes the social organization of innovation was to be taken very seriously. Still, I did not want to die of starvation. So I had to address the question of how to survive the 'centipede's dilemma'. This chapter represents my first attempt at doing so.

To survive requires a change in perspective: the centipede has to assume an interventionist view. It has to design useful actions, taking a stance on what the 'desired state of affairs' is. However, without a thorough understanding of what the available and useful options for action are, such a stance might only worsen its fate. As an activist, the centipede's main problem is to avoid jumping to conclusions about ends and means. As a thoughtful animal its main worry is to choose from a long list of possibilities. Without articulated ends and means (i.e. 'still hunger' and 'use your legs') it dies of starvation. Yet without a 'theory' to help it choose between options and/or propositions (i.e. 'get food' and 'move leg no. 2 first') it will end up no different. In order to survive, both are required. The same holds true for the 'intervention path' initiated in this chapter. Eventually, a methodology for intervention should combine both: (1) a procedure for arriving at an action strategy, articulating both ends and means in a specific enough manner to be implemented, and (2) a number of useful theoretical perspectives to help make a choice between different available options when designing a strategy.

This chapter presents the first evidence of the struggle of designing a useful perspective and methodology. It aims at defining a useful approach to intervention in the social organization of innovation in complex agricultural theatres. I will not claim to define the only possible or best way to intervene. But its usefulness will be tested in the field as part

of the design process. The chapter is organized as follows. Paragraph 2.2 explores some initial considerations for designing an approach to intervention. It spells out a number of requirements for a methodology to be considered useful. It argues a choice for soft systems thinking or more in particular, soft knowledge systems thinking, as an approach to intervention. Systems thinking is the theme of section 2.3. Contrasting its two main traditions of the moment, hard and soft systems thinking, it becomes apparent why the approach chosen in this book is in line with the latter. In 2.4, I will briefly introduce knowledge systems thinking. I will not attempt an overview of the field and its development over time. This has been done on several occasions by Niels Röling and others, including myself (i.e. Röling, 1986, 1988, 1992; Röling & Engel, 1990, 1991). I want to focus instead on the insights and critical issues which have pushed us on in developing it. This provides me with a chance to position knowledge systems thinking as a 'perspective' rather than a 'theory'. Finally, in 2.5, I draw some of the implications of the views developed in this chapter, with respect to my own research.

2.2 Initial considerations for designing useful interventions

What requirements are to be fulfilled if interventions are to be (potentially) useful? Innovation has to do with the quality of our probing for new insights, new wants and new definitions, as well as with the adaptation and use of existing ones. In the diffuse, largely self-guiding and often unintentional process of innovation, what conditions are to be met by interventions in order to be considered (potentially) useful? The following remarks must be taken as a first, intuitive approach to the problem. They stem from reflective practice rather than from scientific inquiry.

A first observation is that any approach or methodology should aim at facilitation more than control. Facilitation implies enabling instead of fully controlling relevant processes. It assumes innovation-related processes to be largely self-guiding but also affected by the opportunities and constraints inherent in the way actors are organized. At the same time, it presumes that no single actor can develop a fully comprehensive view of all processes relevant to innovation. Therefore, allowing for *partiality* is a necessary ingredient of any approach to designing interventions. Facilitation also means an emphasis on *process* rather than *product*. Rather than just on the outcomes of innovation-related processes, it seems our focus has to be on their quality in order to design useful interventions.

Given the many different actors who at many different levels take decisions affecting the innovation of agriculture, any practical approach should account for the diffuse, social and often epiphenomenal (cf. Lindblom, 1990) character of innovation processes. A 'central management' of innovation-related processes in complex theatres is not an option. Distributed responsibilities, differences of perceptions and/or interests need to be allowed for. Interventions may seek to facilitate mutual adjustments between actors who seem to be committed to innovation in a similar way, but differences in perceptions and/or interests may not always be mendable for the sake of innovation. In many theatres continuing power struggles among actors seem more indicative for the type of innovation that occurs than for the accommodations among them. Any methodology for intervention in complex innovation theatres should therefore accommodate to arbitrariness, *allowing those concerned to make judgments* in terms of means and ends, by creating space for

contextualization and (re)appreciation of views, positions, and relationships among social actors.

Equally interventions should anticipate considerable randomness in actual innovation processes. Unintended consequences of intentional as well as unintentional actions may be expected to affect innovation both positively and negatively. The famous remark of Gelia Castillo: "waiting for perfection is a form of abdication", (in: Röling, 1988) sums it up. In complex innovation theatres something like the "best means to an end" does not exist. Always, many possible and acceptable ends compete in the perception of those eventually involved in judging the means. Innovation strategies therefore, are not only highly judgemental, they have to make do with large degrees of uncertainty about what actors want, think, will do and would want to commit themselves to. Intervention methodologies *may seek to decrease such uncertainties* yet have to *accommodate to coping with a considerable degree of randomness* which will still persist.

Another consideration intuitively relevant to intervention in complex theatres of agricultural innovation is the importance of taking into account the *emergent forms* that evolve when several actors succeed in articulating innovation strategies towards a relatively well-defined set of objectives. An approach to intervention should take into account such forms and their influence upon the process of agricultural innovation. It should therefore seek to define which forms to look at and how to probe their influence. Intervention in the social organization of innovation *requires an understanding of the ways and consequences of strategizing beyond the level of actions by individual actors.*

Finally, I would like to propose that a methodological approach to intervention in the social organization of innovation would have to remain *'manageable'*, both with regard to time span and participants. Given the complex and appreciative character of such interventions, wide participation of relevant stakeholders seems indicated. But, in order to speak of a useful intervention concrete objectives and specific choices with respect to timing and participation need to be made. Therefore, the approach itself is to be defined in terms of its process, its inputs, outputs and procedures.

A choice for a soft knowledge systems perspective

Upon my return to Wageningen, in 1985, I was introduced to the knowledge systems perspective, as Röling and others had started to develop it (cf. Röling, 1988). It was 'recognition at first sight'. It set my mind to work instantly and it immediately helped me to make sense out of some of my most mind-rocking professional experiences. I happily admit it was this profound intuitive recognition of its practical value, rather than a balanced scientific inquiry which initially guided me. Knowledge systems thinking provided a perspective, a practical 'way to look at things'. It helped me to focus on a domain of inquiry, the social organization of innovation. It also allowed me to engage in action-oriented discourse about new, largely unexplored territories of human endeavour. But at the same time it lacked a consistent conceptual framework to help me derive pertinent explanations. Its holistic, inclusive character seemed to have enormous potential for stimulating discussions and learning among practitioners with regard to their drives and interactions for innovation. But participants in such discussions often ended up more intrigued than satisfied.

In hindsight, I can enumerate a number of reasons why knowledge systems thinking appealed to me. The first was its potential for combining, and even integrating, macro and micro perspectives. As a development professional, I very strongly felt the need to be able to look at human actions at different levels of analysis. In my experience a combination of individual and collective strategizing had often tipped the scale in favour of certain innovations. I felt *systems* thinking could help me look at emergent qualities, and their relevance to the innovation process. *Knowledge* systems thinking attracted me because of its emphasis on knowledge rather than extension. My experience with popular education in Latin America and with participatory methods in both West Africa and Latin America had already shifted my practical interest from extension to facilitation and sharing of knowledge, information and experiences amongst people. Furthermore, upon my return to the Dutch 'Information Society' I was practically forced to recognize how knowledge was rapidly becoming a vital resource at all levels of society. But, at the same time, I felt a growing unease with the treatment knowledge often received, as if it were a simple 'commodity' to be developed and marketed in the way shoes or transistor radios would be.

The knowledge systems perspective seemed to resolve other more practical questions, which had been on my mind since I studied Diffusion of Innovations Theory in the seventies. Why do we have to content ourselves with seeing people only in their roles as innovators, adopters, laggards, or worse? Can't we integrate a more comprehensive notion of 'human agency' into our thinking? Knowledge systems theory seemed to provide a 'pre-Maturanean' notion of knowledge as intrinsically related to effective human action (Röling, 1988). But finally, what most attracted me to the knowledge systems perspective was its potential for (a) looking at innovation in agriculture as a *social* effort, requiring a collective competence of mutually articulated actors (rather than the sum of individual competencies) and (b) its potential for designing *interventions*. The purpose of developing knowledge systems theory is "...to develop a tool, or diagnostic framework for analysis, design and management" (Röling, 1992: 53). Such a perspective appealed to me as a manager, suited my interest in the social organization of agricultural innovation and coincided with my experience in the field that 'everybody depends on everybody else' to make innovation work. I decided to start my path towards intervention by looking at systems thinking and knowledge systems theory.

While providing a number of useful perspectives, which I will return to in section 2.4, the knowledge systems perspective did not provide a methodological approach to intervention. This I found in Checkland's *Soft Systems Methodology* (Checkland 1989; Checkland & Scholes, 1990).

2.3 Systems thinking, systems practice[1]

In this section, my purpose is not to present an exhaustive review of systems theory. Even if that were possible, it would not be functional to this book. What I would like to do is to abide by Louise Fresco's statement that "what matters (...) is not the definition but the *concept* of system" (Fresco, 1986). Systems thinking is what it says it is: *thinking*. It is an approach to studying reality and intervening in it. It has grown out of the efforts and experiences of many scientists and practitioners who found themselves wrestling with situations like the centipede's. Systems thinking has been developed as an approach - not necessarily the only viable one - to probing and dealing with complex situations. This approach has been taken up by many disciplines for many different types of complex situations. As a result the 'systems approach' is an extremely diverse phenomenon. Below I will briefly introduce those elements of systems thinking needed to follow and evaluate the approach as it evolved in the course of this study. At the same time, it will provide me with an opportunity to link my own approach to the work of those scholars whom I have found particularly inspiring or helpful.

The 'system' metaphor

Although there is no common account of the concept 'system' in literature, as Checkland & Scholes point out, it is generally taken to refer to "the image or metaphor of the adaptive whole which may be able to survive in a changing environment" (Checkland & Scholes, 1990: 19). This metaphor has spurred diverse people to look at different phenomena from a 'systems perspective', as if the set of components they study were behaving like such an adaptive whole. In practice, the word 'system' is used in a variety of ways. Marchal (1975, cited in Kramer & De Smit, 1987) distinguishes three:

(1) 'system' as an object of study for theoretical research, such as a group in sociological research, or types of equations in mathematics;

(2) 'system' as a set of activities in the functional sense of the word, having a purpose; for example the 'system' a doctor uses to attend to a patient, or an information system;

(3) 'system' as some*thing* we want to consider as a whole (italics added, PE).

In each of these uses, the word 'system' refers to phenomena in the 'real world' taking the world to be systemic. The same authors, however, point out the importance of distinguishing between looking at the world *as if* it were systemic, and taking it to *be* systemic. Checkland & Scholes (1990: 22) point at the same fundamental difference: can a 'system' be taken as something which actually exists, an ontological entity, or is it a perspective, a concept or theoretical construct we use to study real life situations?

The position I choose coincides with the latter view. I do not think we can take the world to be systemic. Systems thinking does not provide us with an ontological account of what the world *is*. It does however, provide us with a perspective, a way to study what we perceive to be relevant in the world as well as a way to formally represent and test our findings. Therefore, the validity of our studies will always depend upon the appropriateness of using such a construct in a particular situation. In other words, the use of systems constructs is not necessarily the best possible way of studying a complex situation. The

[1] I owe this title to Peter Checkland (1981).

questions which have to be answered are: When, in what types of situations is the systems approach *useful* to our aims? And what type of systems approach is to be used?

Systems thinking: creating and using systemic images

Checkland & Scholes (1990:22) point at the confusion which has been created by not making a clear enough distinction between using the word 'system' for some part of the 'real world' as opposed to using it to refer to some abstract construct. To overcome this confusion they propose to adopt Koestler's (1968) term 'holon' when referring to constructed abstract wholes. Systems thinkers, in fact, *construct* their systems by formulating ".. some holons (x) relevant to aspects of perceived reality which they are interested in, and then use the holons in a methodology, *M*, to find out about, or gain insight into, or engineer, some of the world outside themselves" (Checkland & Scholes, 1990: 22). Where in fact I agree with their observation as to the confusion created and the definition of what systems thinkers have in common, I do not adopt the term 'holon' to refer to such mental constructs. In our view, Koestler uses the notion of an adaptive whole in a changing environment in a more ontological sense. Koestler (1968: 197) argues, that although the concept seems clear at first glance, one should not take the word 'whole' as self-explanatory because "...wholes and parts in this 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". For these 'Janus-faced sub-assemblies' Koestler proposed the word *holon*, derived from the Greek 'holos' (whole) with the suffix 'on' suggesting a particle or part.

To refer to the abstract constructs systems thinkers use to study the world, often called 'systems' or 'systems models', I will use the term *'systemic images'*. My choice pays tribute to the fact that perhaps one of the main assets of systems thinking is that it stimulates our imagination. Consequently, I will use the term 'system' only when I refer to a way of thinking - as in 'systems thinking' - or when I refer to the procedures, mechanisms and sets of activities *designed* as wholes. When I have to refer to something in the perceived world I want to consider as a whole, I will simply limit myself to the word 'whole'. If necessary I will specify in each case whether I am referring to an *abstract* or a *concrete* whole. Liberally interpreting Checkland & Scholes (1990:25), I then derive the following description of systems thinking: *systems thinking is to set some constructed abstract wholes or 'systemic images' against the perceived world to help us study it.* The aim of such a study may be to more adequately intervene in it, to illuminate certain aspects of it, or more generally, to learn about it.

Systems learning: hard and soft systems thinking

The current debate amongst systems scientists with respect to the assumptions underlying their use of the concept of 'system', according to Checkland & Scholes (1990: 25), has led to two complementary traditions in systems thinking and systems practice: "the 'hard' tradition takes the world to be systemic; the 'soft' tradition creates the process of enquiry as a system". In the following I will attempt to summarize the main differences between the two traditions.

Hard systems thinkers take their systemic images to be models, or simplified *representations* of real world wholes. "The essence of the use of models is to create a material or formal representation of the system to be investigated which is easier to study than the system itself" (Kramer & De Smit, 1987:117). Representation is central to hard systems thinking. The better the outcomes of their models coincide with actual observed events, the better hard systems thinkers consider their knowledge to be. Another characteristic of hard systems thinking is its emphasis on processes of transformation. "The way in which inputs are processed into outputs determines the *function* of a system" (Fresco, 1986: 41). Hard systems thinkers imagine their systems to perform a function which can be described as transforming 'i' into 'o'. Even if the process which transforms inputs into outputs is not exactly known, or is not considered very relevant to the analysis, transformations of inputs into outputs are captured in models which are constructed with the help of so called 'black boxes', systemic images which specify only incoming and outgoing relationships (Kramer & De Smit, 1987: 53). Röling (1994: 5) cites Rabbinge (1993) to point out the generic image hard systems thinkers use to construct their systemic images: "A system is a limited part of reality with well defined boundaries".

Soft systems thinkers do not take the world to be systemic nor do they assume their systemic images can be developed into representations of (parts of) wholes in the 'real' world. Systemic images can be used to build instruments of inquiry. In soft systems thinking such images are constructed in order to develop different perspectives to stimulate reflection and debate and a (partial) accommodation between social actors and practices. As a consequence, soft or 'social constructivist' thinkers create their systemic images along different lines. For them *"a system is a construct with arbitrary boundaries for discourse about complex phenomena to emphasize wholeness, inter-relationships and emergent properties"* (Röling, 1994: 6). By emphasizing its arbitrary, or rather its *appreciative* nature - i.e. different people from different perspectives may construct different systemic images, even if they abide by the same general rules - Röling's definition sets the stage for deconstruction, debate and accommodation.

The explicit mention of a purpose is an important aspect of the 'soft' way of defining systemic images. 'Systems' do not *have* a purpose they are *given* one. A description of any purposeful whole must be from some declared perspective. Due to the appreciative character of such perspectives or world views, multiple perspectives are always available to construct different images of the same situation (Checkland & Scholes, 1990: 24/25). Consequently, for soft systems thinkers systemic images are 'windows' upon the world rather than representations of the world. Each one of them implies a way of looking at the world and can be constructed to reflect different world views or perspectives. They are ".. a means to an end, which is to have a well-structured and coherent debate about a problematical situation in order to decide how to improve it. That debate is structured by using the models based on a range of world views to question perceptions of the situation" (Checkland & Scholes, 1990: 42). What is looked for in the debate is an accommodation between varying interests, concerns and propositions. "It is wrong to see SSM (Soft Systems Methodology; PE) simply as consensus-seeking. That is the occasional special case within the general case of seeking accommodations in which the conflicts endemic in human affairs are still there, but are subsumed in an accommodation which different parties are prepared to 'go along with'" (Checkland & Scholes, 1990: 29).

Table 1: Hard & soft systems thinking compared

Hard systems thinking	***Soft systems thinking***
The world (W) *is* systemic.... or can be taken *as if*...	W is not systemic...but sometimes it is useful to take it *as if*...
Images are to be systemic....	Images are systemic when useful...
Methodology of inquiry (M) may be systemic...	M is designed as a (learning) system....
System images are used to construct models to represent (parts of) the world...	System images are used to construct windows to study the world...
System images are concerned with processes, inputs and outputs...	System images concern social actors, their activities and relationships...
The aim of hard systems thinking is to improve one's knowledge about the world through improving one's models....	The aim of soft systems thinking is to improve human performance through debate and reflection ....
Processes are functionally articulated into a goal-seeking whole...goals are inherent to the whole	Social actors might behave as a systemic whole if they wish to and know how to do it....boundaries and goals are permanently (re)negotiated

In soft systems thinking, do images necessarily have to be systemic? Checkland & Scholes (1990: 23/25) emphasize the systemic nature of the inquiry, rather than that of the images (or 'systems models'): "SSM is a systemic process of enquiry which also happens to make use of systems models. It thus subsumes the hard approach, which is a special case of it, one arising when there is local agreement on some system to be engineered." The images Checkland proposes are constructed by connecting sets of activities to make a purposeful whole, or human activity system[2]. Particularly in view of the present weakness of soft systems methodology in addressing the cultural, social and political aspects of inquiry, to be discussed later on, for the present I will not 'a priori' exclude the possibility that non-systemic images, constructed on the basis of insights, created by disciplinary thought, might yield useful windows for soft systems approaches as well.

[2] see for further discussion: the systems thinkers tool kit II, further on in this section.

One of the most important systemic images soft systems thinkers create and use is the one guiding their intervention. Conventionally SSM is created as a cyclic learning process a team of researchers engages in to apply systems thinking to the real world (Checkland & Scholes, 1990: 27). A more sophisticated version distinguishes between two streams of inquiry, the logic-based and the cultural one, guiding 'would-be improvers' into a learning process leading to the implementation of changes to improve a problematical situation (Checkland & Scholes, 1990:28). During this process the methodology helps generate paradoxes, differences between systemic discourse and observed practice, stimulating reflection and (modified) action, in subsequent learning cycles. As a result, soft systems methodologies seem well suited to facilitating social learning processes amongst actors in theatres of agricultural innovation.

In a very simplified manner, the learning cycles of the soft and hard traditions of systems thinking may be summarized. *Hard systems thinkers* create systemic images to guide the construction of models representing transformation processes. In subsequent learning cycles they perfect their images by comparing the outcomes of the models they have constructed to observations in the real world. The purpose of hard systems learning is to achieve useful simulations of real world processes in order to help achieve an ontological understanding of the world, often in order to be able to predict or construct certain events. *Soft systems thinkers*, on the contrary, construct images, not necessarily systemic ones, to derive heuristic windows. In subsequent learning cycles relevant windows are developed and used to study human practices. The aim of soft systems learning is to generate and achieve accommodations amongst relevant actors in order to improve organized human performance.

Some criticisms of soft systems thinking

Soft systems approaches have been criticized severely for their emphasis on harmony and consensus-seeking (Jackson, 1985). Checkland & Scholes (1990: 29; cited above) have indicated that consensus is one special case amongst many cases of seeking accommodation in affairs of human organization. After having reviewed the social impairments, power struggles, conflicts and, as I heard Norman Long put it once, 'battles over images' which play a role in the social organization of probing and coordination for innovation in complex agricultural theatres, one may expect me to shy away from such naive attempts as soft systems approaches to address such a conflictive topic. The contrary is true. If, as I have argued, the roots of innovation are in continuous interactive probing, by social actors who search for divergence as well as accommodation, the conflicting parties will usually find a way of expressing themselves in soft systems learning cycles. *If* a number of conditions are fulfilled, the problem becomes one of *specifying such conditions*. This also means that soft systems methodologies are not always the best means to tackle problems. A second challenge then is to describe *in which types of situations they are most useful.*

On the other hand, not all conflicts of power have to be dealt with immediately or at the same time. Innovation in agricultural practices, although sometimes qualified as 'revolutionary' by some, is generally a process of slow, but insistent tinkering with underlying principles, conventions and rules. In line with Lindblom (1990), I would argue that in agricultural innovation processes usually no single person can be found who 'pulled the trigger'. By way of illustration: we will probably just 'end up with' genetically manipula-

ted milk, the chain of decisions having led to such a situation being too diffuse and too long for anyone to grasp entirely. The notion proposed by Lindblom (1990) of meticulous probing into impairing influences which stand in the way of the search for alternative developments, seems a viable and useful contribution. As a result, I may conclude that in order to make soft systems methodology into a tool for facilitating innovation in complex agricultural theatres, we have to be very explicit about who is to participate as well as about why and how they do. In order to do this the introduction of the notion of *relevant diversity* and the specification of minimum conditions and *quality standards for communicative interaction* amongst actors in the process are required. What 'relevant diversity' means will have to be discovered along the way, as will the conditions and standards of communication which have to be met. However, in view of the social character of innovation processes in complex theatres, the need to encourage a strong or even extreme 'competition of ideas' (Lindblom, 1990:) seems obvious, if stakeholders are to be able to entertain the illusion of carrying the formulated solution strategies through to their actual implementation.

A limitation of the soft systems tradition, as it now stands, is its lack of a complete enough set of operational tools to explore the relational dimensions of social (inter)action. As Checkland & Scholes (1990: 48) rightfully observe, the social science literature does not easily yield usable 'systemic images'. As a result the authors set out to develop experientially two more streams of inquiry, in addition to the well-probed and well-documented first stream of 'logic-based' inquiry in SSM; one directed at 'social system' analysis and one at 'political system' analysis. In such complex, multi-actor situations as are common in agricultural innovation theatres, I felt I should put greater emphasis on probing and assessing the influence of social relationships. In order to do this, I would need to broaden the 'subjectivity issue', strongly embedded in soft systems reasoning for developing different declared perspectives upon the human activities studied, and relate it to the handling of social relationships as well. I took Vickers' suggestion that 'relationship maintaining' might be a richer concept than 'goal-seeking' for characterizing human action (cited in: Checkland and Casar, 1986:4). Furthermore, appreciation as selective perception of reality and making judgments about it in terms of (maintaining) social relationships, seemed particularly relevant. My focus would have to zoom in on judgment-making and relationship-managing by social actors who engage in probing ends, means, opportunities and constraints in order to improve their practices or develop new ones. The focus would have to amplify the range of issues soft systems thinking can be applied to by including an *appreciative, social relationship-focused dimension*. Only then would it be possible to pay explicit attention to the many issues of power and influence which play a role in enabling and/or impairing social interaction in complex innovation theatres.

Another critical issue is the emphasis on 'wholeness' in systems thinking, also apparent from the definition given by Röling (1994: 6). "Holistic ambitions for social scientists and citizens alike often mark the scientific model of society..."(Lindblom, 1990: 226). Often, it is associated with the aspiration that a single, comprehensive theory may eventually be formed to answer all questions from a distinct set of universally valid axioms. However, since "Gödel showed that if you fix the rules of inference, and any finite number of axioms, there are meaningful statements that can neither be proved nor disproved" (Ruelle, 1991: 145), few scientists support such a position. When we, including Röling

(1993), emphasize 'wholeness' we definitely do not entertain such a 'unified theory' aspiration. Rather, we refer to the fact that we probe for coherence among the events and ideas which appear to be relevant to our inquiry. We refer to the need for gaining *more* comprehensive way*s* of debating, not a unified scientific theory for understanding. We see the need to do so because of the ever growing degree of complexity involved in the debate on social and technological issues.

In my view, Röling's definition must be amended. Two fundamental issues are to be built in which systems thinkers should and often do emphasize: *randomness* and *choice*. Earlier, I developed the argument that innovation as a social process cannot be understood unless its epiphenomenal character is recognized fully. In complex innovation theatres a lot 'just happens'. This means that systemic images of complex innovation theatres have to make allowance for large degrees of randomness in order to accommodate the unexpected, the irrational, the unknown. Besides, the element of choice is emphasized. Innovation, I argue, emerges from complex and diffuse processes of social inquiry and interaction during which social actors continuously make choices. In constructing their systemic images, soft systems thinkers should choose to include the element of choice too. Soft systems methodologies should emphasize the permanent (re)construction of views, opinions, propositions, interpretations and commitments.

The systems thinkers' tool kit I: concepts

To study something as if it were a 'system', according to Kramer & De Smit (1987:19) the following questions have to be answered: (1) which entities are part of this 'something'? (2) which entities do not form part of it, but influence it? (3) how do the entities within this 'something' relate to each other? (4) how do the entities within this 'something' relate to those outside? This implies some *boundary* is to be drawn in order to distinguish those entities inside from those in the environment of the 'something'. At the same time a *level of analysis* is chosen to reduce the complexity to manageable proportions. The result of such an inquiry is a systemic image (or 'system' in the terms of Kramer & De Smit), composed of: (1) a set of entities placed within its boundary, (2) a set of entities placed in its environment, (3) a set of relationships between the entities within its boundary, and (4) a set of relationships between those entities within its boundary and those in the environment. Of course, each entity within or outside its boundary can in itself be thought of as a system, while at the same time the systemic image can be looked at as an entity within a wider 'whole'. It follows that hierarchies in systems thinking, like boundaries, are tools for construction, not accounts of phenomena to be observed in the world. Where they do coincide with such phenomena in the perceived world, it is because the systems analyst has *intended them to do so*.

The concept of *hierarchy* is often misunderstood in systems thinking. Hierarchy refers to the different orders or levels of assembly at which systemic images, their relationships and their emergent properties can be constructed. Unlike the use of the term in bureaucracies, in systems thinking hierarchy doesn't necessarily imply authority or direct control. The degrees of freedom the entities have within the large whole depend eventually upon the nature of the *relationships* which are assumed to exist between them. If such relationships are understood as "structural couplings", defined as "a history of mutual concordant structural changes as long as the units do not disintegrate" (Maturana &

Varela, 1984:50), the relationship can be understood as a mutual perturbing or tickling without one-sided power of determination or instruction. If, however, the relationships are understood - or have been designed - to impose absolute authority of one entity over the others, the two-sided 'tickling' reverts to one-sided 'hammering', with the unfortunate entity at the wrong end having no choice but to accept the blows or do as it is told. In other words, the dilemma 'Janus-faced subassemblies' (Koestler, 1968) face depends upon the way its relationships with others like it are interpreted and/or designed.

According to Checkland & Scholes (1990: 19) hierarchy is tied closely to another concept in systems thinking, i.e. *emergence*. Emergence refers to the idea that the whole has properties which can not be fully understood in terms of the properties of its component parts. 'Emergent properties' can be associated with a systemic image created at a specific hierarchical level but would not be apparent from studying each entity or component separately nor by simply taking the sum total of their properties. The types of properties which can be expected to emerge therefore depend upon the level of analysis or assembly of systemic images that is chosen. The properties the researcher looks for at each level, depend upon his or her sense-making or theorizing with regard to the phenomena studied and the systemic images constructed accordingly.

Probably one of the most hotly debated issues in systems thinking is *behaviour*. Mostly, systems analysis is done in the hope of understanding, predicting, engineering or influencing the behaviour of 'some thing or body' considered to be one whole. Behaviour is generally defined as subsequent changes in the state of a whole over time (Kramer & De Smit, 1987: 50). The choice of variables for describing such changes of state, introduces another appreciative element into the analysis. With Maturana & Varela (1984:111) I coincide that to speak of 'behaviour' implies the existence of an external observer describing these changes and making sense of them, may be by singling out 'relevant' or 'effective' actions. The observers' observations will mirror his or her own volitions, dispositions, preoccupations and concerns. Hence, such choices are to be made explicit. They are tied closely to the function or purpose attributed to the whole by the observer.

Another key notion in systems thinking is *communication*. It is often associated with control. In a soft systems perspective, this is misleading. Communicative interaction is one very important way in which mutual adjustment among social actors takes place. Effective and sustained communication is at the root of developing and maintaining standards of competent performance in and between practices (Gremmen, 1993). Furthermore, communication processes play an important role in creating and disseminating the results of centralized decision-making. Communication, taken as a process, does not equal 'convergence', as Rogers & Kincaid (1981: 43-57) have it. Communicative interaction may lead to convergence as well as divergence in understanding, believing and/or action.

The systems thinkers tool kit II: creating systemic images in practice

Not all systemic images are constructed the same way. To start with, the entities described may differ. The choice of systemic components amongst all possible ones is generally done on the basis of their perceived relevance to the phenomena studied and debated. Therefore social system thinkers take people, organizations, political parties, societies, etc. as entities. Agricultural scientists select crops, weeds, pathogens, insects or

soil types when they study cropping systems. Boundaries are also defined on the basis of relevance: "Within the boundaries all relevant interactions and feedbacks are (to be) included, so that all those components that are capable of reacting as a whole to external stimuli form a system" (Fresco, 1986:41; () added by PE). The choice of entities and boundaries go hand in hand: when new relevant entities are identified, these are included and boundaries are shifted.

However, not only the choices for 'filling the boxes' differ, the way the systemic images are designed may differ as well. In hard systems thinking, most systemic images are *input/output arrangements*. It is considered vital to name inputs and outputs as entities. Hence, the modelling language is based upon *nouns* (Checkland & Scholes, 1990: 34-35). The structural arrangement of the image as well as an eventual model are based upon chains of input/output transformations. The transformation *process* is the central focus: "a transformation or a series of transformations brought about the throughput of a system as a result of which the throughput is changed in position, shape, size, version or some other respect" (Miller and Rice, 1967; cited in Kramer and De Smit, 1987: 51). The function of the whole is achieving the required transformations according to previously set specifications. The purpose of creating the images is to build a model that can be used to study the processes. Examples of such systemic images and models are most farming systems and industrial processing models. Some of the early knowledge systems approaches (see for example: Beal et al., 1986; Swanson, 1986) reflected a similar functional perspective.

Checkland has introduced a different type of systemic images: "purposeful holons known as 'human activity systems'" (HAS/Checkland & Scholes, 1990: 36). Here the modelling language is based on *verbs* (for activities), "and the modelling process consists of assembling and structuring the minimum necessary activities to carry out the transformation process...". The structuring of the model follows logical contingencies, specifying the logical sequence in which activities are to be performed in order to achieve optimum performance. The function of the whole is seen as "doing the job well". But different specifications may be possible, according to the perspective or 'world view' different actors hold. Therefore, the purpose of creating relevant images is to facilitate an accommodation in perspectives between relevant social actors and to improve (collective) competent performance. I will refer to this type of systemic images as *activity arrangements*. They are developed, not to achieve a representation of the real world but to construct meaningful arrangements to evaluate human practices. Activity arrangements have been fundamental to developing the soft tradition in systems thinking. A number of the early knowledge systems images resembled activity arrangements more than i/o arrangements (see for example: Havelock, 1969; Nagel, 1980; Röling, 1988; Haverkort & Engel, 1990).

For the sake of studying social relationships among actors, I propose to distinguish a third way of creating systemic images. These may be labelled *actor arrangements*. The modelling language is now based on *names* referring to individuals and/or collectivities within a certain domain of human activity. Here, the modelling process consists of assembling those actors and their relationships relevant to the mission(s) attributed to the whole. The function of the whole is seen as *articulating individual competent performan-*

ces in order to achieve a joint performance. The purpose of building the images is to study and if possible to improve the interactions which support joint performance. The structuring of actor arrangements can be based on different theoretical perspectives with respect to the relevance of relationship maintenance for innovation. Assuming integration between social actors affects performance, one may look at the frequency and importance of contacts between actors as perceived by them. Experimental work along these lines has been done by Van Beek (1991), Frempong (1988) and myself (Engel, 1990; see also chapter 4). When looking at how coordination between tasks is achieved, one may look at how configurations of power and influence emerge between actors (Engel & Seegers, 1992; see chapter 5). When mutual adjustments amongst actors are focused upon, one may look at communication networks (Engel, 1993 (cf. chapter 3). Blok and Seegers (1988) and Millar (1992) contributed to this line of thinking as well. In this book I will try to show how the use of different images of this type allows us to strengthen the *appreciative*, social relationships focused character of soft systems methodologies.

Towards a soft systems approach for facilitating innovation

Given the degree of complexity and randomness, as well as the appreciative and emergent character of the social organization of innovation in agriculture, I chose a soft systems perspective to guide my methodological design for intervention. It was clear from the very start that intervention could never mean control, or even centralized management. My focus had to be on *facilitation* instead. If at all useful interventions were possible, I thought, soft systems thinking with its recognition of widely different yet relevant world views, of many different relevant 'systems' and the element of choice in practical situations, should be helpful. Besides, its central concern coincided with mine: improving human practices, not by reaching a scientifically 'best' solution but by reaching a practical one accommodating in the best way possible the views and interests of those involved. Another important consideration was that soft systems methodologies put learning-in-practice (or knowing) and making-a-choice central to their approach. Soft systems methodologies seek to facilitate an interactive learning process among participants to facilitate the creation of new perspectives, new propositions, different interpretations and accommodations between social actors. Care would have to be taken to specify the conditions to be fulfilled to enable relevant actors to participate effectively. The soft systems approach to intervention seemed to fit the facilitation of probing for innovation I had in mind.

A third consideration was the soft systems methodology's emphasis on active participation of relevant actors. Although this seemed easier to achieve in the corporate environments in which Checkland c.s. developed their methods, wide participation would have to be part of a methodology for probing the social organization of innovation, if the volitions, propositions and dispositions of relevant social actors had to be accounted for in the process. A number of questions remained open, such as: who is to participate? who decides? and how? I was then left with the problem of developing appropriate 'windows' for probing the social organization of innovation in complex, practical situations. To fit the soft systems tradition, these need not be derived from systemic images but they could be. As I will show in the next section, the knowledge systems perspective permitted me to create a first set of useful perspectives.

2.4 The knowledge and information system perspective[3]

The knowledge and information systems (KIS) perspective has been constructed as a diagnostic framework to unearth the organizational forms which enable and/or constrain knowledge processes, such as generation, transformation and use of knowledge and information. It focuses on organizations and/or persons, and the links and interactions between them (Röling & Engel, 1990). Its definition has evolved over the years. A recent one is given by Röling (1992b):

> *"the articulated set of actors, networks and/or organizations expected or managed to work synergically to support knowledge processes which improve the correspondence between knowledge and environment, and/or the control provided through technology use in a given domain of human activity."*

Being framed in a soft systems perspective, the boundaries of the system are not given but tied into its objective or function. They depend upon the perspective of the analyst and are therefore bound to vary with the function or purpose this analyst has in mind for the system to perform. And as 'correspondence and control' may mean something entirely different to each of the actors involved, in such a definition a struggle over purposes, perspectives and boundaries is implied. For soft systems analysts, therefore, boundaries of systems are arbitrary and in each situation a large number of different wholes can be named. As a result, the knowledge system definition should not be taken as an ontological description of what *is*, but rather as a verbal 'rich picture' (Checkland & Scholes, 1990: 45) of what *could be*, if and when constructed in such a manner by those social actors involved.

The explicit purpose of developing knowledge systems thinking is to develop a diagnostic framework for analysis, design and management (Röling, 1992b). The knowledge systems perspective is to provide stakeholders with a useful approach to reviewing their interactions in the light of some stated objectives, in order to design more effective forms of communication and cooperation. Its aim is to help develop proposals for action in practical situations. 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'. The KIS perspective, in other words, serves the purpose of joint reflection and design of intervention. Explanations are left to the stakeholders to come up with, while the perspective helps draw attention to a number of salient issues. Necessarily the perspective generates many more questions than it permits answers. And it does not necessarily include a theoretical framework to suggest explanations of observed phenomena. Its definition emphasizes 'purpose' rather than 'explanation'. This seemed to make it into an appropriate, over-all perspective to be used for inquiry into the social organization of innovation.

The knowledge systems perspective has emerged as a result of a large number of 'formative experiences' (Röling, 1992b) of applied social scientists who tried to come to grips with the complex phenomenon of facilitating innovation, mostly in agriculture. In

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[3] This section draws on Engel, 1991, first part.

order to guide inquiry in search of relevant issues and propositions, the KIS perspective makes a number of *assumptions*, it offers a number of *useful perspectives* each of which includes a number of *lessons from experience*. I will briefly review these contributions in the light of this study and review a number of *critical issues* as well.

Assumptions

The most central proposition defended by knowledge systems thinking is that, effectively, knowledge processes are socially constructed and, because of that, actors may seek to influence if not manage them. Röling points at its emergence, in several parts of the world, as that of "...an idea whose time had come" (Röling, 1992b: 48). However, this may well be the only similarity between the various schools of thought, as I have indicated in 2.2. Some emphasize the 'science-practice-continuum' as a continuum of inter-related knowledge processes (i.e. Lionberger & Chang, 1970), others the 'diffusion of innovations' (Rogers, 1983, 1986), others the development and utilization of technology (Kaimowitz et al., 1990; Swanson, 1986), while still others emphasize the interaction of between different relevant communities or subsystems (Nagel, 1980; Havelock, 1986; Röling, 1988). Therefore Röling's emphasis on the development of *a* tool is misleading. The knowledge systems perspective has already yielded a number of tools, each based upon a different theoretical conceptualization of knowledge processes and their articulation in practice. Röling (1990: 17-) for example describes "one-way models", in which knowledge or technology is supposed to flow from research to farmers and not the other way around, and "two-way models", in which there exists a conceptualization of feed-back on needs and problems from the users of technologies to research and other actors controlling resources relevant to innovation. Röling (1990: 17) points out that the first is the most common and influential way of modelling, in which scientists develop products which extension has to sell.

A second proposition underlying the knowledge systems perspective is its understanding of *communication* as a form of social interaction. Knowledge, communication and information are intrinsically related yet are distinguished for analytical purposes. People actively make sense out of their experiences in the world. They build theories that attribute causes to effects and apply these to control the socio-natural environment for their purposes (Röling and Engel, 1990). *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. In order to do this, these latter may have to recur to particular skills they have acquired, such as listening, reading, interpreting computer data, etc. and/or the use of specific artefacts, like reading glasses, computer terminals, etc. 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. When farmers listen on the radio to a newscast promoting the use of agrochemicals, one may understand it as recommendations from a better world, not meant for him who has no money to buy them, another might interpret it as undue propaganda for substances which will destabilize the

environment and yet another may rush to the shop to buy the amount he (thinks he) needs. Within the knowledge systems tradition, finally, *communication* is generally referred to as the production, exchange and processing of (symbolic) information between two or more social actors (cf. Oomkes, 1986). It may lead to a shared understanding but this is not necessarily the case. Such communicative interaction is not uncommitted, each of the participants brings in his or her own world view, interests, concerns and objectives. Therefore, communication is taken an inherent part of social strategizing. In chapter 8, I will come back in detail to the role knowledge and communication play in innovative performance. This will also imply that the visions expressed above, of knowledge as a relatively static 'asset' of people and of communication as merely a relationship between individuals, are amended.

A third central assumption in the knowledge systems perspective is that *innovation* is the desired outcome of a knowledge system (Röling, 1992b: 52). The link between knowledge, technology and innovation is assumed to be an important one. Yet at the same time, this link itself is hardly ever probed deeply. The wide-spread use or utilization of knowledge, information or technology is generally equated to innovation, innovation being the result of a process of discovery, development, spread and use of either of these, or a combination of the three. Finally, what binds these traditions is an *organizational focus*. Each of them defines a number of tasks which have to be completed and coordinated in order to accomplish innovation. Each of the schools defines such tasks in a (slightly) different manner depending upon whether technology, knowledge or information is taken as the main resource for achieving innovation. The common denominator between the tradition is the view that it is important to study the social organization of innovation. From there, however, conceptualizations and inquiries move into entirely different directions. In view of the intentions of both schools to contribute to designing more adequate forms of organization for innovation, as I will demonstrate later on, these differences are extremely consequential.

For the moment it seems sufficient to point out that the major difference resides in the way 'knowledge processes' are defined. Since the late eighties, what sets the 'Wageningen School' of knowledge systems thinking apart is, in the first place, its emphasis on the soft, appreciative character of the social organization of innovation, in the second place, its emphasis on qualitative research and in the third place, its commitment to social learning and social construction of new forms of organization for innovation between stakeholders. The first leads to a inclusive and heuristic, rather than a mutually exclusive, descriptive definition of the tasks to be fulfilled by the actors of a knowledge 'system'. This leads to the definition of 'systemic images' and 'windows' rather than 'models'. I will further illustrate this issue later when I address the different ways 'functional differentiation' can be viewed from a knowledge systems perspective. The second is in line with the above and favours the development of new, useful perspectives to generate reflection and debate, rather than a comprehensive explanatory theory as a result of scientific research. The third leads to systematic attention for actor participation in design, anticipation and accomodation between social actors and for innovation as a social process.

Useful perspectives

Research on knowledge and information systems has yielded a number of perspectives relevant to studying the social organization of innovation. Many of these have focused on functional differentiation between research, extension and farmers and as a consequence have emphasized issues of functional 'calibration' and linkage between those organizations and institutions involved in agricultural development (i.e. Beal et al., 1986; Swanson, 1986; Kaimowitz, 1990; Merrill-Sands & Kaimowitz, 1990; Eponou, 1993). Benefitting directly from these and other studies, within the 'Wageningen School' of knowledge systems thinking I have concentrated on the following approaches to conceptualizing complex situations with respect to the social organization of innovation (Röling & Engel, 1990, 1991; Engel, 1990; Röling, 1992b):

A. Focusing on intentionality, context and performance: this perspective helps the analysts study the intentions upon which the social actors' innovation strategies are based, or to explore the (apparent) lack of such intentions. It assumes that, in general terms, the purpose of an agricultural KIS (AKIS) is to facilitate agriculture-related practices to be innovated continuously. An effective AKIS therefore makes available all intermediate outputs - e.g. technologies, software, expert systems, trained professionals and information - necessary to develop such practices as are deemed relevant to agricultural development. Even when such a broad intentionality is recognized, the specific *mission* of an AKIS is permanently debated amongst social actors in one way or the other affected by agricultural performance. Any number of selections of stakeholders may entertain a different view of the mission the whole is expected to accomplish. As a consequence, each of these may define differently what the relevant intermediary outputs are to be. An example from the Dutch horse husbandry sector may illustrate this point. At the one hand, those engaged in the exportation of Dutch horses may favour a fierce, independent character as an important criterium when breeding top quality horses (in order for them to compete successfully in international races). To the contrary, those envisaging the horse sector in the Netherlands mostly as an important recreational sector, enabling hundreds of thousands of often unexperienced riders to exercise their sport, would rather see that a rather a quiet, conformist character is sought after. Consequently, each favours a different definition of what the 'state of the art' in Dutch horse breeding is all about (Engel et al., 1990).

AKIS *performance* can therefore be evaluated on at least four accounts: One may ask (1) how many fundamentally different views exist among stakeholders as to the mission the whole is to accomplish and what definition of the 'state of the art' in intermediary outputs each of these entails. Then one may ask (2) whether the AKIS effectively produces such 'state of the art' in agricultural knowledge and information to support each of these views, (3) whether it does so efficiently and (4) whether the type of agricultural innovation emerging as a result is adequate with respect to each of the missions defined by its stakeholders.

As I have shown, particularly the first and last question are complicated ones. The determination of the type of innovation desired and the direction of change it implies, is generally the outcome of a political process. It seldom is the responsibility of the actors in the AKIS alone. Societal objectives - clean drinking water, fresh air, healthy forests, rural employment, an attractive landscape - play an increasingly important role, whereas

formerly the yardstick was on-farm productivity alone. At the same time, the appreciative and diffuse character of the agricultural innovation process provides social actors in complex agricultural innovation theatres with a large degree of autonomy. As a result, *multi-intentionality*, different or even conflicting views on the type of development which is to be pursued are common in agricultural innovation theatres. And, the political, administrative, technical and economical *context* plays an important role as well. The result of the (more or less articulated) efforts of individual social actors directly involved in the AKIS, is mediated by the effects of international and national agricultural trade and price policies, rules and regulations, and environmental, communication, educational and research policies, available resources, etc. as incentives or, to the contrary impediments against the achievement of the type of innovation desired can hardly be exaggerated.

An example from vegetable growing may illustrate this point: while Dutch vegetable producers, due to environmental considerations, have grown to use substrate as a substitute for soil in their greenhouses, and as a consequence recognize 'substrate use' as the state of the art in vegetable production, Israeli producers feel no need to revert to 'artificial soil'; amongst them competent performance dictates the use of relatively neutral desert soil types, and efficient irrigation systems (Ravensbergen, 1991). However, the animated discussions regarding sustainable agricultural development, and the many points of view which exist as to what this term means, is another case in point.

B. Focusing on functional specialization: AKIS actors are many: farmers' organizations, cooperatives, specialized services, and groups or study clubs; agro-based industries; public and private research, extension, and training institutions; agricultural press and information services; agricultural policy units; and formal and informal networks of many kinds. More recently, environmental and consumer groups claim an increasingly important role. One way to investigate the social organization of innovation in agriculture is to look into the division of labour among its stakeholders. *How are tasks defined? Who does what?* are the leading questions. Social actors, alone or together, occupy a "niche" in the agricultural innovation theatre and develop a relative advantage. As a result, over time these performances evolve into practices in their own right, concerned with particular socio-natural processes and adhering to formal and informal standards of competent performance.

The division of labour between social actors in complex innovation theatres cannot be studied in practice without further specifying the 'knowledge processes', as used in Röling's definition. Many processes may be a candidates to the choice, such as anticipation, generation, transformation, transmission, storage, retrieval, integration, diffusion, utilization (Röling & Engel, 1991: 125). However, several other options are available, some taking knowledge, some innovation, and some technology as the 'active ingredient': 'need identification, generation of innovations, operationalisation for utilisation, dissemination, utilisation, evaluation of experiences' (Nagel, 1980; in Röling, 1988: 201), 'technology development, transfer, utilization' (Swanson, 1986; in Röling, 1988: 203), 'generation, exchange and utilization' (Havelock, 1986: 11), 'technology production, delivery, monitoring & evaluation' (Kaimowitz et al., 1990: 230), 'creation, diffusion and utilization' (Journal *Knowledge*). In order to define a perspective on the functional specialization among social actors in agricultural innovation theatres, the researcher will

have to make a choice, aware of the fact that *each choice reflects a specific model of thinking about the process of achieving innovation in agriculture.* Therefore, the choice must be justified in terms of its correspondence to actual and/or desired agricultural practice. Only after such a choice has been made, the question 'Who does what?' can be answered.

C. Drawing attention to integration through resource linkage: Evidence suggests (Röling, 1988; Engel, 1991; see chapter 5) that the effective AKIS exhibits high levels of integration with strong links among core actors. Moss Kanter (1983) and Wissema & Euser (1988) stress the importance of cooperation and integration of efforts for industrial innovation. Specific organizational procedures used to establish, maintain or improve links are called linkage mechanisms (Kaimowitz et al, 1990). In more complex wholes, linkage mechanisms become more sophisticated and diverse. A certain redundancy in both formal and informal linkage mechanisms is sometimes reported as having a positive impact on integration (Grooters, 1990). An integration perspective is based on the assumption that, in particular situations, the improvement of linkages among social actors relevant to particular types of innovation can lead to improved performance. The types of resource linkages which are considered most relevant to innovation are to be defined in each case. One may focus on communicative, collaborative, administrative and/or financial linkages or focus instead on formal versus informal links (Kaimowitz et al., 1990).

Segmentation refers to the process by which certain categories of actors establish strong linkages because of common elements in their situations (e.g. financed by the same (government) agency), shared concerns (e.g. marketing a line of products or services) or a common strategy (e.g. the promotion of ecological agriculture). Other actors may then target their services and support to such a category. Currently, in the Netherlands 'product chain integration' is developing fast and one may argue that these chains rather than the functional specialization among practitioners is to be taken as the dominant pattern along which 'practices' will be organized in the near future. Segmentation emphasizes shared interests and concerns for primary production more than for innovation. It reflects, in a way, 'vertical integration' rather than the 'horizontal integration' through knowledge networks. At the same time, segmentation may lead to new joint performances as in the case of chain-linked production processes. As it appeared from the Dutch Horse Sector study (Engel et al., 1990), segmentation may be justified by some social actors while others experience it as a serious impairment to innovation and sector integration. Other types of segmentation may exist when social actors decide to link up their efforts in view of a particularly vulnerable agro-ecological zone or culturally homogeneous group of people.

D. Zooming in on actors, strategies, constraints: The multiple character of an AKIS is invigorated by the *relative autonomy* that generally characterizes social actors in innovation theatres. Each of them acts according to its own strategy and operational agenda. They use their own resources, intellectual and otherwise, to achieve their own long and short term objectives. AKIS performance, therefore, has to be envisaged as the combined outcome of the views and actions of many, not necessarily cooperating, social actors. *Agency*, therefore, is a centrally important notion. Actors in theatres of

agricultural innovation "...are capable (even within severely restricted social space) of formulating decisions, acting upon them, and innovating or experimenting" (Long, 1992:24-25; referring to Giddens). Actors may be individuals or collectivities organized in such a way as to be able to formulate and carry out decisions (Long, 1992: 23; citing Hindess, 1986:115), or at the very least, able to effectively influence decisions made by other actors. Social categories, with no visible structure except in the eyes of the researcher, obviously can not be taken as such.

Characteristic to the approach I choose is to attribute to social actors the capacity to strategize, yet to recognize at the same time enabling and/or constraining conditions due to emergent social forms. I postulate a degree of autonomy or self-government as well as certain limits to the degrees of freedom social actors have. Koestler (1968) describes the tension between individual autonomy and the constraints imposed by the whole from a systems perspective: "... the canon represents the codes of conduct ... the 'rules of the game'.... But these constraints do not exhaust the system's degrees of freedom; they leave room for more or less *flexible strategies*..." Moreover, I understand that such constraints are to a large degree appreciative. The actor actively participates in contextualizing, interpreting or even creating them.

We consider government, private or non-government organizations can be studied as social actors as well. Institutionalization provides stability to such social sub-assemblies. Here I recognize the same two-sidedness: the idea that social actors actively abide by some rules while working to modify others seems a fruitful heuristic device to study human and organizational behaviour in complex social theatres. Koestler (1968) describes it as the polarity between a *self-assertive* and an *integrative* tendency in the behaviour of a 'system' component. Similarly each actor can be thought of as trying to assert its own uniqueness, while maintaining a certain level of integration into the higher level whole. This is important because the actor generally derives at least part of its identity, power and 'room for manoeuvre' from the latter. Maturana & Varela (1986: 77) refer to the *operational independence* of a component within a situation of *structural coupling*. The result is a situation of mutual *interdependence* between social actors in complex innovation theatres, a situation which is not always recognized as such by all involved (Kaimowitz et al., 1990; Woodhill and Röling, 1993). This has led researchers to emphasize *perceived* interdependence in their inquiries.

To define a perspective on actors and their strategies, first, a selection of relevant actors has to be made. Such a selection will necessarily be based on a partial view of the theatre. Therefore, the selection can generally be disputed by those holding a different view and, accordingly, defining their boundaries distinctly. A partial view does not necessarily mean a partisan view, although it might be interpreted as such by some. By putting the selection up for discussion among stakeholders, an inclusive list of social actors can be arrived at which, in view of the different parties involved, at least does not exclude crucial members of each of the relevant factions. After this, both formal mandates and informal strategizing may be studied. Besides, the views and interpretations by the actors themselves of their (alleged) mutual interdependence and of the opportunities and constraints they see with respect to innovating their current practices, provide extremely relevant insights to stimulate reflection and debate.

E. Knowledge networks: To successfully make available 'state of the art' knowledge and information among its actors, a continuous circulation of intermediary outputs has to take place within the AKIS. This 'alternating current' leads to chains of product transformations, when each actor works transforms what he/she receives into suitable new forms, anticipating the demands of his/her particular clientele. The circulation itself may be based on informal transactions, barter (e.g. industrial know-how trading; Carter, 1989), or sales (e.g. software, patents, licensing, consultancy), or may involve regulated channelling (e.g. pre-competitive cooperation, project groups, meetings). An increasing amount of evidence suggests that networks of individuals play a pivotal role for maintaining the current of knowledge (half)products and for sustaining innovation (e.g. Carter, 1989; Wissema & Euser, 1988). Field research in the Netherlands and Colombia corroborates the importance of both formal and informal networks (Grooters, 1990; Engel, 1993). Evidence shows that successful networks such as the Dutch study clubs in horticulture exhibit high degrees of member control.

Knowledge networks I take as the more or less formalized, relatively stable pattern of communication and interaction among social actors sharing a common concern (cf. Box, 1989: 76). Such patterns emerge as a result of relation building efforts among actors. The study of knowledge networks concentrates on the generation, sharing and use of knowledge and information between network members. Knowledge networks may exist within organizations or across organizations and institutions. The rules that govern knowledge sharing and information exchange in networks are only partially known. Reciprocity is often stressed as a critical success factor in information barter. Rogers & Kincaid (1981) emphasized the "strength of weak ties". The rules of information barter versus commodity barter have yet to be explored exhaustively. Yet, it is clear that "informal know-how trading is a robust institution that is well adapted to the special requirements of informational exchange" (Carter, 1989). Most participants of effective knowledge networks share a common rationality, that is, their knowledge base is similar to such a degree, that interpretation of each others' information becomes easy and fast. Also, informal networks are generally embedded in long-standing social relationships, mutual understanding and trust being essential to facilitate the sharing of knowledge and information. Networks can be spontaneous and totally informal, or can be designed to serve a purpose.

Since all actors are active, knowing subjects in their own practices, they are at the same time sources and users of knowledge and information on agriculture. A basic assumption behind networking activities is that each of the participants holds a clue to understanding and solving the 'farming puzzle'. Producers no longer rely solely upon their own practical know-how, experience and research-based technical knowledge. As practitioners, they actively engage in communication with others in order to acquire relevant knowledge and information. Marketing knowledge and information provided through cooperative auctions or private advisory services play increasingly important roles. Also, policy-related knowledge and information, produced by EC or national policy bodies, increasingly determine farm results. Similar comments can be made for researchers, extensionists and other actors in complex theatres of agricultural innovation. Research suggests that exposure to, and integration of many different types of knowledge and information, through active involvement in a number of different networks, plus ample availability of information of all sorts, are crucial to an extensionists' effectiveness in modern agriculture (Engel, 1989).

The knowledge network perspective enables us to focus on specific concerns, or types of knowledge (such as marketing, farm management, book keeping, soil preparation, feeding, but also sustainability, soil erosion, cost reduction, automation, nutrient management, etc.), and to trace the way in which relevant actors acquire, share and use knowledge and information related to these concerns. Empirical research can be directed either at revealing priority concerns among different sets of actors, or at tracing the communication practices they use to share knowledge, information, ideas, experiences.

F. Understanding coordination of tasks among actors: Agricultural innovation has come to depend increasingly upon the combined activities of various actors, such as farmers, farmer networks, governmental and non-governmental organizations, agro-based industries and formal and informal markets. As Mintzberg puts it, *"... every organized human activity - from making pots to the placing of a man on the moon gives rise to two fundamental and opposing requirements: the division of labor into various tasks to be performed, and the coordination of these tasks to accomplish the activity"* (Mintzberg, 1983:2). This perspective concentrates on how such a coordination is achieved, if at all, among actors in complex innovation theatres. Yet, the social organization of innovation involves many actors, multiple interests and multi-facetted interactions. What seems right to the eyes of one, may seem wrong in the eyes of another. In fact, from an outsider's point of view, activities by innovating actors often seem contradictory or even chaotic. Social actors are to a large degree autonomous in pursuing their own strategic objectives. Each shares a different knowledge base and responds to a distinct set of opportunities. Coordination in such theatres is not a simple question of imposing control in the traditional, top-down sense of the word. Recognizing the diffuse, mostly self-guiding nature of innovation processes, we ought to be particularly interested in the self-regulative capacities of social wholes. Coordination, therefore, refers to the occurrence - either by design or by default - of sophisticated *coordinating mechanisms* which help enable or, to the contrary, impair certain social actors to adequately perform as parts of the whole. Just how much 'room for manoeuvre' each individual actor needs, may be one of the most challenging questions managers of innovation processes in complex agricultural theatres have to answer. An important line of thinking has been developed by Mintzberg (1983). He analyzes the different ways coordination can be achieved in large organizations.

Mintzberg (1983:151-155) concludes that coordination of tasks in organizations can be achieved in various ways. Depending on the components of the organization which most effectively 'pull their weight', and taking into account external factors, certain coordinating mechanisms may prevail. The first and most hierarchical of the coordinating mechanisms Mintzberg identifies, is *direct supervision.* The boss supervises staff, instructs them and controls their output. It is characteristic for an organization with short lines of command where the top management is directly involved in all or most of the important decisions to be made. It places all controls directly in the hands of the top. Coordination can also be achieved through *standardization.* Mintzberg identifies three possible ways of standardization: *standardization of outputs, skills and/or work processes.* Different types of actors value and endorse different types. Standardization of outputs is generally preferred by middle managers who aim to run 'their own shop'. It leads to the formation of divisions in the organization, each responsible for developing and marketing specific products and/or services. Placing the responsibility of coordination with the

operating core or 'field' staff of an organization, requires standardization of knowledge and skills. Each of them has learned how to do the job so they do not have to be told by anyone. Standardization of work processes places the responsibility for coordination with the specialists who design the technical and administrative standards and procedures. Others must comply with those rules and regulations applicable to their role in the organization. The organization is designed to regulate work processes to the highest possible degree, to eliminate uncertainties and to run smoothly, like a well-oiled machine. A fifth mechanism Mintzberg identifies is *mutual adjustment*. Administrative and other support staff often favour such an arrangement. It provides them with power to directly influence operations by making ad-hoc decisions. Until recently, Mintzberg claims, such adjustments were largely left to chance. "But in recent years, **organizations have developed a whole set of devices to encourage liaison contacts between individuals, devices that can be incorporated into the formal structure.** In fact, these *liaison devices* represent the most significant contemporary development in organization design - indeed, the only serious one since the establishment of planning and control systems a decade or two earlier"(Mintzberg, 1983:82). At the end of his book, almost as an afterthought, Mintzberg (1983:293) offers a view beyond the five mechanisms he has identified. *Standardization of norms* is a sixth coordinating mechanism, leading to coordination being achieved as a result of a shared *ideology*.

The predominant influence of one set of key actors within the organization endorsing its own favourite prime coordinating mechanism leads the organization to take on a particular structural shape, or as Mintzberg puts it, a *basic configuration*. Characteristic of a basic configuration is the type of actors that are able to exert leadership and the key coordinating mechanisms they use to impose or facilitate coordination. Most organizations, however, experience each of these 'pulls' at the same time. This is only natural, as most organizations include top managers, middle managers, specialists, support and operating staff. The configuration therefore reflects the degree to which each of these sets of actors can reinforce its claims within the organization. If they are successful, their favourite coordination mechanisms may gain momentum and contribute to shaping the organization in a pertinent manner.

Another line of explanations, which I include in my argument, singles out incentives. Sims and Leonard (1989) suggest four possible parties that hold the key to positive incentives for competent performance in AKIS's: national policy-makers, farmers organizations, agro-industry, and financial donors. The strong influence of agricultural producers on the Dutch AKIS, is well known. In Europe, other strong candidates include the EC, environmentalist and consumer groups. In chapter 5, I will combine these two lines of argument to explore how coordination is achieved in agricultural innovation. Hopefully, this will allow us to open a window on leadership and the use of power and influence in complex innovation theatres.

G. An eye on knowledge management[4]: Using the AKIS perspective to look at the social organization of innovation systematically may allow us to define a useful approach to knowledge management in complex theatres of agricultural innovation. I have identified

[4] This section makes use of Engel (1991).

multiplicity in actors and perspectives, diversity in types of knowledge and information and a considerable degree of randomness as inherent qualities of a diffuse and largely self-guiding social process called innovation. What is more, such complexity may be a condition for adequate adaptation of a particular AKIS to rapidly changing circumstances. Multiple wholes, capable of handling knowledge and information from a diversity of sources and types, are potentially well equipped to make rapid adjustments to unexpected changes in demands and circumstances. Also, they relate naturally to a multi-functional, sustainable agriculture that does not solely stress productivity values, but also societal values of a less quantifiable nature - clean drinking water, fresh air, healthy forests, rural employment, and an attractive landscape.

Under such circumstances, can anything be *managed*? I have shown how different appreciations of what an AKIS is to accomplish and of what type of agricultural development is desired, may differ greatly from one social actor to the other. Declared missions may contradict each other or be in open conflict, as is the case at times with regard to the declared objectives of the environmental vis-a-vis the agricultural lobby in the Netherlands. Generally, not one single management unit can be identified, nor one central manager. Each relevant actor will have its own managers and responsible strategists. Certain segments or functional units may show some degree of unified management. But that does not, generally, hold true for the whole. Multiplicity of social actors in innovation theatres is reflected in a large variety of managers and management styles which affect probing for innovation. In such a situation, the task of the knowledge manager can never be straightforwardly objective-oriented. Not only the means are in dispute, the ends as well. And different lobbies defend different interests. The desired long-term developments for the agricultural sector are a matter of political decision-making. The contribution of managers at different levels may then be to facilitate the *process of inquiry* into relevant objectives, options and conditions as well as to tend to the design and implementation of effective *cooperation and communication strategies* aimed at improving the quality of inquiry and the transparency of its outcomes. Wissema & Euser (1988) speak of creating "win-win situations" as a condition for successful cooperation in industrial innovation. Moss-Kanter (1983) argues that without specific incentives and management support, the organization leaps into "default", ideas and initiatives are suffocated and innovativeness is stifled. I suggest such a supportive task on behalf of innovation and social learning, aiming at articulating individual efforts in order to achieve a joint innovative performance, to be labelled *knowledge management*. The design of knowledge management strategies may then be supported with *actor arrangements* as systemic images which reflect such intentions (cf. p. 2-14).

H. Facilitating innovation at different levels of analysis: knowledge management tasks will have to be performed by many different individuals at a number of levels. At least four levels may be distinguished: individual, network, organization and the theatre as a whole. First, at the individual level, farmers, extensionists, and researchers can be considered knowledge managers "avant la lettre". Farmers are not recipients and reproducers, but creative managers and integrators of knowledge and information from a large number of sources, including their own practical experience and that of their friends and colleagues. Farm-related communication patterns reflect diversity (Schiefer, 1991), and different groups of farmers develop significantly different management styles in the process (Bolhuis & Van der Ploeg, 1985). Extensionists create and defend a surprising

degree of autonomy in handling knowledge and information, against centralist tendencies to standardize their behaviour and messages (Wagemans, 1987; Engel, 1989). The use of knowledge and information by individual farmers and extensionists will be addressed with the help of two case studies in chapter 3.

Second, one may look at the knowledge management in networks of social actors, at how different types of knowledge are shared and integrated between practices, or, on the contrary fail to be connected and how actors create joint performances. We may also look for ways of storing and retrieving information among members of a network, and at other concrete activities network members engage in. We may ask ourselves when and why social actors decide to invest in networking, we may look at the dynamics of networking or at the sustainability of networks over time. A number of studies have pioneered this line of research in recent years. Box (1989, 1990) studied knowledge networks in the Atlantic Zone of Costa Rica, Plucknett et al. (1990) networking in international agricultural research, whereas Nelson and Farrington (in prep.) compile experiences with respect to information exchange networking for agricultural development and Alders et al. (1993) compile world-wide experiences with networking for low-external input and sustainable agriculture. My contribution to this last book forms the basis for chapter 6.

Thirdly, one may focus on knowledge management within an organization or institution. It may concern:
- monitoring and evaluation of the circulation of essential knowledge (half)products;
- development of a shared language and culture concerning wide-spread probing for knowledge and information;
- appraisal and adjustment of internal communications, coordinating mechanisms with respect to probing innovations;
- mapping, organizing and management of organizational learning, including the development and use of a company thesaurus, reporting and debriefing procedures, in-service training programmes, study groups, expert consultations, information systems, and other instruments;
- stimulating the formation of knowledge networks or task forces on strategic issues, filling (expected) gaps in the organization's knowledge base;
- appraisal and, if necessary, modification of incentive structures;
- the allocation of resources to alleviate existing impairments to probing behavior.

Managerial decisions, or influence, may also be extended to the structural arrangements within the organization as far as consequential to the organization's institutional learning capacity. Externally, the knowledge manager is concerned with the management of interfaces between the own organization and external sources and users of relevant knowledge and information. The management of knowledge and information within organizations falls outside the scope of this book (e.g. Jorna & Simons, 1992). The *learning organization* receives considerable attention (e.g. Senge, 1990; Argyris, 1992; Swieringa & Wierdsma, 1992).

Finally, one may consider the orchestration of the AKIS as a whole. At this level facilitation would aim at strengthening over-all AKIS performance. Unified management is usually impossible. Instead, the objective is creating added value from cooperation, communication and networking efforts. From the literature I suggest the following areas to merit particular attention (see also Röling, 1989; Verkaik and Dijkveld Stol, 1989):

- Developing a shared culture, policy, and purpose;
- Development and maintenance of a shared language and thesaurus, facilitating exchange of experiences and information;
- Avoiding reverse incentives, such as unspannable social distances between actors blocking formal and informal communication;
- Enhancing links and institutional articulations at strategic interfaces;
- Enhancing the use of informal networks, e.g. with the support of electronic media;
- Linking and/or integration of existing computer-based information systems within the AKIS;
- Monitoring functional calibration, enhancing strategic cooperation among key actors;
- Segmenting the area of concern into useful knowledge domains, around traditional and non-traditional user groups;
- Enhancing user control, through political, market, or technical coordinating mechanisms;
- Strengthening the whole's responsiveness to societal objectives, environmental influences, market opportunities;
- Avoiding isolation of the collectivity from external sources of knowledge and information, or from non-traditional target groups;
- Strategic investment in physical infrastructure, human resources and programmes, and financial flexibility in funding;
- Identification of key segments in the whole, balancing resource allocations according to performance requirements;
- Developing AKIS management information systems, their design, operation, potential and limitations.

Some of the main criticisms put forward

The criticisms of the KIS perspective have been sustained and frequent. The latest overview has been given by Leeuwis (1993: 54-59). Earlier versions have been presented by Leeuwis, Long and Villareal (1991). The main criticisms, in my view, include:

(1) The KIS perspective does not consider the role of human agency and power in forging innovations (Leeuwis, Villareal, Long, 1991; Leeuwis, 1993: 57-58). This criticism has been taken very seriously over the past years. As a result, I would argue, the KIS perspective has been enriched with specific conceptualizations which make it possible to study issues of agency, power and influence. No longer is power overlooked as an issue (Röling, 1992b: 52). But that does not imply that its handling, within a soft systems perspective is not problematical. Interventions are necessarily tied into power structures. And soft systems methodologies will have to find a way to deal with it adequately. In this study I will attempt to contribute to it by (a) developing some conceptual tools for studying leadership, power and influence in practical situations (chapters 4,5,7) and (b) by developing an approach to designing which helps take into account rather than obscure power issues in so far as these seem pertinent to designing adequate interventions in particular innovation theatres (chapters 8,9).

(2) There exists a tension (or confusion) between the KIS perspective as a 'practical tool' as against its - supposed - aspirations to offer an explanatory theory (Leeuwis, 1993: 55). The KIS perspective does not provide an adequate theory to explain agricultural innovation had been formulated before (Leeuwis, Long and Villareal, 1991). In my view,

this is not so much a criticism as a statement of fact. As a soft systems' perspective, KIS theorizing should have left behind long ago any pretensions to offer general explanations of what is observed in practice. The much criticized 'KIS disorders' (Röling, 1989), the 'common treats' (Blum, 1990) and - supposedly - 'normative statements' (Röling & Engel, 1990) are no more and no less than lessons of experience articulated by practitioners to be used only to frame questions for generating and sharing observations about a particular situation amongst social actors and not for explaining it. In soft systems methodologies, the explaining is to be left to the social actors themselves who are considered 'knowledgeable and capable' enough to generate explanations relevant to their own situation. This way, the lessons of experience represent the contours of an 'epistemology' and do not even come close to pretending an 'ontological' description of what happens in the social world. In respect to this part of the criticisms I would argue that, instead of a criticism of KIS as a perspective, it points at the ever growing need to develop a more ontological understanding of the social organization of innovation. Its availability would also help avoid that some are tempted to use the 'rules of thumb' from the past for analytical purposes. It would also help straighten out to a large degree the confusion Leeuwis (1993: 55) rightfully puts his finger on.

(3) The KIS perspective overemphasizes formal institutions and relationships at the expense of informal ones (Grooters, 1990). Particularly the early attempts at formulating the knowledge systems perspective suffered from the effects of pro-institutional bias. The agricultural knowledge system was defined as a broader term yet empirical studies often focused mostly on institutional mandates, functions and interactions. Informal links were often subsumed into discussions about formal interactions. It was research by Pijnenburg (1988), Box et al. (1989, 1990), Grooters (1990), Van Dijk, Leeuwis & Engel (1991), Rap (1992), Stolzenbach (1992), Obate (1992) and Millar (1992) which contributed significantly to our ability to see formal links in perspective. This study hopes to contribute to creating new useful perspectives for analysing the role of informal links in processes of innovation.

(4) The definition of knowledge and information used in knowledge systems thinking is problematic (Leeuwis, 1993). Leeuwis (1993) arguments centre upon the ambiguity of the information concept. While Röling & Engel (1990: 7) accept the paradoxical nature of information as existing - in matter/energy - yet having differential meanings as far as these may be attributed to it by different people, Leeuwis (1993: 56) seems to insist upon solving this contradiction by denying the usefulness of a difference between knowledge, the 'real world' and information. Leeuwis concentrates his arguments on two key issues: does information as matter/energy have a meaningful existence of its own, or can we assign objective qualities to information? And can a sharp distinction be made between 'knowledge' and the 'real world'? From the point of view of a scientist looking for mutually exclusive categories in order to build an unambiguous theory about what happens in the world, of course not. Yet, from the point of view of one who intends to engage in meaningful discourse about what we perceive as happening in the world, my question is different: is it useful to make a distinction between the three? Then my answer is: yes! It is useful to create a distinction between our perceptions of the world and the 'real stuff', implying we accept arbitrariness and partiality on our part with respect to understanding what is going on. This distinction, from a soft systems perspective implies nothing more, and nothing less than a creative paradox to stimulate discussion and debate.

Also I can engage in meaningful discourse about the transfer of information by referring to it as 'interpretable patterns' (i.e. somebody may attribute a meaning to it if certain conditions are fulfilled) with a physical existence (newspaper, book, radio program, etc.). I can usefully ask myself why everyone who read my book, listened to my program potentially may have attributed different meanings to it. Even if I know very well that my 'meaningful discourse' only mirrors my own particular understanding of what is going on. I agree with Leeuwis (1993: 56) that "...information has no meaning if it cannot be internalized, and by being internalized, it becomes part of a stock of knowledge." But then our ways part: by attributing meaning to what I read in my newspaper and internalizing it, the paper does not cease to exist, even if only as a sorrowful remnant of an erstwhile proud pine forest.

However, on his third and most important critique, I agree with Leeuwis (1993: 56) that in early versions of our conceptualization of knowledge we have emphasized the individual-cognitive dimensions of knowledge and communication, to the detriment of its social, intersubjective, and practical (i.e. practice-oriented) dimensions. I do agree we did rely too much on cognitive psychology and information theory to conceptualize our human beings as information processors. In the present book, I intend to show that now a more sophisticated conceptualization can be aspired at based on an understanding of 'knowing' rather than 'knowledge', of 'competent performance' rather than 'the use of new technologies' and of 'communicative interaction' rather than 'communication' as the transfer of messages between senders and receivers. This will allow us not only to theorize more appropriately about the social dimensions of the knowledge processes we are studying, but also to develop a more appropriate view on social practices, as competent performances emerging within a context of social interactions between - lay and professional - practitioners. Although, as I have argued above, I do not pretend to develop the KIS perspective into an explanatory theory but to complement it with useful explanatory images and their respective windows, these latter will provide us with an active conceptualization of human action, something urgently needed in the eyes of Leeuwis (1993: 59). I am afraid, however that it will not eliminate all remnants of what he calls the "...optimistic 'enlightenment' thinking that characterized the early days of extension and extension science". Even the most relativist of facilitators, in order to intervene must feel that even if not perceivable right now, somewhere at the end of the tunnel some light must shine.

2.5 Developing the knowledge systems perspective further

My interest in what people and organizations, as social actors, actually *do* to innovate their practices, means that the main thrust of this study will be to explore the possibilities for facilitating innovative (inter)action amongst individuals and/or organizations, not within organizations is not my main concern. Not that facilitating innovation processes in organizations is not interesting, but because it is particularly in that area that major conceptual developments are already under way. I will also leave to others the over-all orchestration of nation-wide or international AKISs. In this study, I will use a soft knowledge system perspective to explore the possibilities of facilitating innovation at the interpersonal and inter-organizational levels: the levels of innovative interaction between individuals, on the one hand, and between organizations concerned with regional or

sectoral agricultural development, on the other. However, I will also argue that, what makes a KIS successful as a whole are the relationship patterns that are a result of such interactions. They are the sustenance of the social organization of innovation as far as I can see. It follows that the relevance of much of what I may suggest for facilitating innovation will not be confined to the individual and organizational networking levels only.

The KIS perspective is not meant to be a theory, it is meant to be a soft systems perspective: it focuses attention on a domain of inquiry, not on one particular way of explaining what we observe. It provides suggestions for making an inventory of relational problems implied in the social organization of agricultural innovation. Its generalizations refer to relational problems or solution strategies which have been perceived, discussed and taken as a basis for intervention by practitioners. In order to formulate interventions, it proposes a general focus which suggests relevant social actors to consider working *together* rather than against each other in order to enhance sustainable development. Therefore, as Leeuwis et al.(1991: 24) have rightfully observed, we maintain that it is useful to promote the idea of a shared mission or common purpose in the process of designing such interventions. What this mission is, to which degree it is shared by all and whom the 'relevant' actors are, is to be determined along the way by those actors who consider themselves stakeholders.

To be supportive of such a process, what the KIS perspective needs in the first place is a structured approach for engaging social actors in inquiries, decision-making and the design of actions and/or interventions to improve innovative interaction. My stroll along the ***'design path'*** is intended to result in the design of a methodology for such a purpose. It engages in a 'double loop' of the science of the artificial (cf. Simon, 1976): to design an approach to enabling stakeholders to (re)design the way they organize themselves for innovation. In the second place, what practitioners and researchers need in order to anticipate upon and judge who the relevant actors are, how they relate to each other and what the impact of power and influence may be on innovation in complex agricultural theatres, are coherent conceptualizations concerning the social organization of agricultural innovation which allow them to generate a more comprehensive understanding of relevant issues. Such conceptualizations should take into account human knowing in its cognitive, relational and practical dimensions. The ***'exploratory path'*** aims at contributing to this objective.

3. *Communication for innovation in Dutch agriculture*

3.1 Introduction

In this chapter I intend to demonstrate that the notion of 'knowledge transfer', even for the activities of extension services, fails to recognize the multiple and social character of communication for innovation in agriculture. The case studies focus on individual persons; natural actors who, as part of their daily activities, communicate with other actors in order to acquire new ideas and/or knowledge. I will explore this issue in an - empirical manner: I will look at the use of knowledge and information in practice by two categories of social actors relevant to most agricultural innovation theatres: farmers and farm advisors. Their daily work are the context within their communication takes place. Therefore, I will take the daily activities of farmers and advisors as a starting point, and explore what knowledge and information they use, how they acquire it and from where. I will not limit myself to the use of formal sources of information. As many have shown, informal communication amongst farmers, researchers, extension staff and/or advisers might be as important in deciding the course of agricultural innovation as is its formal, often overrated counterpart (see: Grooters, 1990; Box, 1989, 1990; Pijnenburg, 1988).

Apart from context, the approach takes the sense-making aspects of human communication as its central focus. Human communication, in its most basic form, can be taken to mean the production, exchange and processing of (symbolic) information amongst people (cf. Oomkes, 1986). Some authors add a convergent trend to it, as did Rogers & Kincaid (1981: 63) who define communication "as a process in which participants create and share information with one another in order to reach a mutual understanding" . I don't think this is necessarily so. Rather, I think, extension practice forces us to take divergent trends in attributing meaning to information very seriously as well. The production and processing of information therefore, is to be taken as an appreciative activity, it implies creating - in the case of production - and attributing - in the case of processing - meaning and significance. Information, as such, is no more than distinctive patterns created by somebody to reach out to somebody else. Unless the others, farmers or otherwise, pick up the patterns and attribute some meaning to them, no effective communication will take place (cf. par. 2.4 for a more detailed discussion).

Rogers & Kincaid (1981) were amongst the first to address the issue of communication networks for innovation in agricultural and rural development. They recognized the importance of "interconnected individuals who are linked by patterned communication flows" (Rogers & Kincaid, 1981: 82). Rather than focusing upon 'sources' and 'receivers', they attempted to address communication as a networking process, shared amongst numerous individuals at the same time. Their approach was very much inspired by early social network analysis and focused on analysing the structure of such networks, identifying cliques, communication roles and communication structural indices. Here, I

have chosen a more qualitative approach, but the notion of networks of individuals communicating amongst each other, rather than pairs of individuals communicating between each other, seems to be an important step into the direction of understanding communication as a social process with obvious relevance to our study.

At the same time, my first concern is not so much with existing patterns of relationships as it is with their emergence, the process resulting from the purposive efforts of social actors to communicate with each other in order to generate and share knowledge, ideas and experiences. Communication networks are the more or less formalized, more or less stable patterns of communication that emerge as a result. The fact that communication is taken as a purposive activity doesn't always mean it corresponds to explicit intentions on the part of all actors involved. However, as I place my studies within the context of the work setting of social actors, communication itself takes on a functional dimension: social actors expect to benefit from maintaining communication with specific other social actors. The potential added value is in improving one's knowledge and/or skills with respect to one's own role in agriculture.

In this section I have combined two case studies which took as their prime interest to study the use of knowledge and information by one type of social actors in agricultural innovation theatres. This permitted us to trace existing communication networks from two different perspectives. First, I look at the use of knowledge and information by farm advisers of the Agricultural Extension Office of Tilburg, covering the North Eastern part of the same province. Then, I take the farmers' perspective. I look at their sources of information with respect to agricultural operations in Asten, a mixed farming district in the province of North Brabant in the Netherlands. Both farm advisers and farmers appear to behave as professional knowledge and information managers 'avant-la-lettre'.

3.2 CASE A: The use of agricultural knowledge and information by farm advisers[1]

I take my example from the, then, Government Extension Service in Tilburg in North Brabant in the South of The Netherlands. This is a primarily mixed farming area, with a strong dedication to intensive animal husbandry. To study the use of knowledge and information by farm advisers, in close consultation with key informants, I selected one important topic: the on-farm, outside storage of animal manure. That is, the temporary storage of animal manure in an outside tank or silo on the farm premises. Storage of animal manure is of great importance in The Netherlands because of its environmental implications. During the years 1986-1988 it was one of the main topics in the Government advisory service. In 1988, though no longer the hottest topic of the day, it represented an issue of such importance in the area that all extension advisers did have to cope with it many times during their career. Information was collected through in-depth interviews with 5 randomly selected advisers, out of a total of 17 which covered the area. In addition, the 2 relevant subject-matter specialists and one extension unit head, himself a farm economics specialist, were interviewed. The interviews were focused on the advisory cycle, starting with a request by the farmer and ending with an advice by the

[1] This section is an adapted version of Engel, 1989: *Kennis- en informatiegebruik...*

adviser, and brought out the use of knowledge and information during this cycle. In the following paragraphs I will first look at the use of documentary information. After that, I will analyze the advisory cycle itself and study the types of knowledge and information used in order to complete it successfully.

Actual use of documentary information: The information portfolio

As part of the interview, I asked the advisers to provide me with a set of the documents they kept at hand when being called to advise a farmer on 'on-farm, outside storage of animal manure'. I was interested in what written, or documentary information the advisers actually carried with them when going to meet a farmer who might want to receive advice on the topic. From experience I knew advisers were showered with documentary information of all kinds, much of which ended up on a shelf back home, if not in the waste basket. Therefore I was not so much interested in the total amount of information the adviser might have at his or her disposal. And in fact, most could show an additional load of paperwork on the topic they kept at home! However, I wanted to focus on information which was *actively used.* I labelled this set of documentary pieces of information, the *information portfolio*, as it was handcarried around by the advisers when doing their farm visits. The results are summarized in figure 2 and table 2.

The first thing that catches the eye is the diversity and broad coverage between the individual information portfolios. Figure 1 illustrates this too. Just on this one topic, a total of 109 documents were collected amongst the five advisers. *No documents were found which all of the advisers kept close at hand.* And only 2 appeared in 4 out of the five portfolios studied. From the considerable amount of documentary information from industry, farmer organizations, farm journals, and dailies, present in the individual portfolios, only very few are kept handy by more than a one adviser from the sample. Another telling detail was the fact that, of all official documents provided on the topic by the agency's subject-matter specialists, only very few were actually carried in the portfolio, even though a considerable number of these was explicitly intended to be taken along on farm visits. Apparently, advisers search and value such types of information in a very personal, individual way.

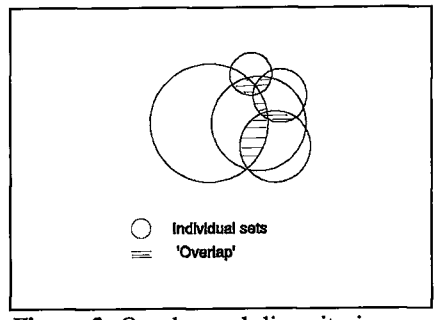

Figure 2: Overlap and diversity in information portfolios of farm advisors (Engel, 1989)

Policy and technical information derived from Government, specialists, and research sources seems to be the more standardized - but not even as much as one might have expected! Of the 13 documents kept at hand by at least 3 out of the 5 advisers interviewed (see table 2), 11 are from such sources. Not without some exaggeration, these 13 could be labelled the *standard portfolio.* However, these 13 represent only 12 % of the total number of documentary pieces of information on the topic carried by these 5 advisers!

What provokes such diversity in the use of information? The study came up with at least 3 plausible lines of explanation. First, the individual adaptation of the portfolio occurs as

a result of the adviser's *appreciation* and priorization of the problems affecting the producers in his or her district most. Those problems farmers are wrestling with most the adviser will study more carefully, searching and reviewing more information, in order to develop a strong 'offering'.

Table 2: Number of documentary information pieces found in advisers' handset of information on the topic of "outside storage of animal manure", according to source type, and the overlap between the different sets (Engel, 1989).

Type of source/# overlap:	Total	#=2	#=3	#=4
Government policy	38	15	4	0
Specialists/national research	18	8	3	1
Regional experimental stations	18	9	4	1
Service industries	9	3	2	0
Farmers' organizations	3	1	0	0
Dailies/journals	20	1	0	0
Total pieces doc.info	109	37	13	2
% total overlap	100	34	12	2

Secondly, an important role is played by the personal interest and *specialization* of the adviser. If he is more interested in technical rather than managerial matters, he will select more technical and less managerial information. Of course, considering this aspect, pre-service and in-service training of the advisers plays an important part as well, as do the relationships advisers develop with different subject-matter specialists. A very interesting observation was that such tendencies seem to be reinforced through the relationships the adviser develops with his or her clients. The interests and strengths of a certain adviser become known in the farm community, and increasingly he or she will be called upon for such matters as seem in line with his or her strengths. This, again, stimulates his or her further personal development along these lines, etc. In other words, a positive feedback-loop between expectations and specialization develops.

Thirdly, advisers select their information with great care, considering a number of criteria related to the usefulness of each piece of information to their work:

(1) *Relevance:* Does the piece contribute specifically to the solution of those problems currently felt to be most relevant in the district he or she covers?
(2) *Added value:* Does the use of the information piece produce an immediate benefit to the completion of an advisory cycle?
(3) *Suitability:* Does the information fit well into the approach and logic the adviser uses to do his or her work;
(4) *Appropriation:* Have the adviser, or close colleagues, been actively involved in the development of the particular piece of information, so that they feel its theirs to use as they see fit? For example, when they participated in the gathering and evaluation

of the data that permitted the author to write the piece, or, when one of them produced the piece.

(5) *Ease of use:* Is the piece of information concise, brief, and to the point, ready to be used?

(6) *Availability:* Can the piece be left with the farmer in case he or she asks for it? Some indicated reluctance to take anything with them to the farm, which they could not replace if left behind.

On 'relevance' and 'suitability' the data showed that these vary with time. Two pieces of documentary information were found with two advisers which in essence contained the same message: the relevant sources for a farmer to obtain a subsidy for constructing new manure storage. Yet they were not the same pieces. Both were articles in agricultural journals, the review of which is standard practice amongst the advisers. The articles were published six months apart. Yet, one adviser picked up the first article while the other picked up the second one. Probably, each of them picked it up at the time it was most 'relevant' and most 'suitable' for him/her.

Of course, one may not generalize on the basis of this one study, and more research is definitely needed. Studying different topics from manure storage, may yield very different results. However, the data can't be shoved aside as particular to this group of advisers. For one, during an independent check on my sample I was able to confirm that in the eyes of their supervisors, none of the advisers interviewed was anything less than good in his/her job. Secondly, when presented back to the advisers the data didn't raise as much as an eye brow. In fact, my description of the use of documentary information, its origin and consequences were considered 'normal practice'. Faced with a structural overload of documents thrown at them from all sides, advisers learn to develop very selective strategies for the actual use of information.

When confronted with these findings in a discussion, with the advisers and some of their superiors, we were able to put forward at least four important propositions:

(1) Quality in advisory work doesn't seem to depend on standardization so much but on diversified access to information from a variety of sources. Managers of farm advisory services often seem to believe the opposite.

(2) Advisers develop professional information acquisition and selection strategies. They use clear criteria to make autonomous decisions on the information they use: in their eyes, useless or vague pieces of information are not kept, nor are they used. The quality of their work depends upon it.

(3) The *degrees of freedom* advisers are permitted in order to develop and enact such strategies might be as relevant to the quality of advisory work as are standardized information packages offered by specialists. A *degree of redundancy* in information offerings might well be functional. Both contribute to enabling advisers to effectively construct their portfolios in a timely and situation- and client-specific manner.

(4) The *diversity of goals, specializations, and niches* recognizable in the work of agricultural advisers reflects a decentralized management of innovation processes, a feature well-known to be an important factor for successful innovation (Evenson et al., 1979; Moss-Kanter, 1983).

Eliciting the structure underlying professional information use: the 'main menu'
During the interviews, the advisers were asked to describe the events as they occurred during an advisory cycle: From the moment a farmer makes the first contact and asks for advice on 'outside storage of manure' to the moment the cycle is completed, and an advice given. They were asked to focus in on the last time they had completed such a cycle, in order to describe a real example, not a generalized account. The cycle would normally include at least a few phone calls back and forth, and one or two visits of the adviser to the farm. From the interviews it appeared that the way in which extensionists analyze manure problems with the farmers at the farm level, can be seen as 'variations on a theme'. Although each of their accounts was different, common ground existed with regard to the issues attention was subsequently focused upon. This common ground can be made explicit by superimposing an analytical framework, which I labelled the adviser's 'main menu' (as in the 'main menu' of software applications). The *'main menu'* (figure 3) represents part of the knowledge and skills of the farm adviser. It enables him or her, when discussing a certain problem with a farmer, to focus on relevant issues, to ask the right questions at the right moment, to perform analyses and weigh different factors, and to provide specific pieces of factual information. All of this in order to complete the advisory cycle successfully.

Recognizable in the main menu as it became apparent from the Dutch advisers' practice, is the focus on problem reconnaissance, problem definition, comparison of alternative solutions, choice of solution, implementation, and follow-up. The resemblance with traditional problem-solving models is striking. However, as they appear, these focal topics are not necessarily sequential steps in a process, but clusters of issues which may be addressed in any sequence. Also, not all clusters are always attended to or attended with the same intensity. Rather, the clusters represent *fields of analysis* to be accessed when need arises. "The more experienced farmers become in manure storage, the more their need for information moves down the scale" was a typical remark of one of the respondents. Meaning, that more experienced farmers would not need his help in problem reconnaissance or definition, they would immediately ask for solutions or even only ask his or her (second) opinion as follow-up. This, however, would not necessarily exclude the possibility to later on return to reconnaissance or definition, in order to clarify some points or review the validity of the conclusions reached in view of new information.

In addition to the fields of analysis, the main menu represents a variety of *types of knowledge* to enable the adviser to ask the right questions at the right time. On the one hand, it includes *knowledge about farming*. Issues to be considered concern the actual situation of the farm and its operations, as well as the strategy this particular farmer is implementing to run it. On the other hand, it includes knowledge about the opportunities and limitations which this particular (type of) farmer faces, and which constitute the social, economic, technical, institutional and cultural context within which the farm has to be developed. This *knowledge about the development context* for farming operations, includes knowledge and know-how about laws and regulations, subsidies and norms, as they apply to the particular area, and to the type of farm under consideration. Secondly, it includes knowledge about, in this particular case, technologies to store, process, and/or improve the quality of animal manure. In other words, about the range of technical options available to the farmer to solve his or her problems. And thirdly, it includes knowledge about the chances and difficulties the market offers, for selling or transporting

manure to areas of deficit, quality norms that apply to different types of manure, prices, and quantities. For all types of knowledge, implied in the 'main menu', it is understood that it does not only concern the actual opportunities and limitations, but also the (expected) developments in the future.

Figure 3 summarizes the main menu in a two dimensional way. Along the vertical axis, the fields of analysis are indicated, along the horizontal one, the types of knowledge relevant to 'outside storage of animal manure'. The sequence of both fields of analysis and knowledge types is arbitrary. During an advisory cycle, each relevant[2] *knowledge field* or cluster of issues corresponding to one field of analysis and one knowledge type, can be accessed at any moment in order to generate the right questions, information and/or answers to suit the process of interaction between the adviser and his or her client. In every encounter between adviser and client, the eventual path chosen through the (knowledge) fields will be contingent upon the initial situation of the farmer, the approach both chose to take to confront the issues at stake and the professional competence of the adviser. With the help of the main menu, each advisory cycle can be recognized as unique: the outcome of professional communicative interaction between two individuals. But at the same time, the systematic approach of the professional adviser is apparent. He or she supports his or her work with a 'basket-full' of issues, organized in such a way as to permit the successful completion of a great variety of advisory cycles on a certain topic of concern[3].

As in the case of the information portfolio, the main menu itself evolves during interaction between farmers and advisers. However, more than even the portfolio, previous education and in-service training seem to influence the way advisers develop to approach their clients. Discussions with colleagues on priorities and main issues play an important role as well. Subject-matter specialists, particularly during initial in-service training courses and when visiting farmers with the adviser, may influence this learning process decisively. It seems to be clear, however that the 'main menu' not only reflects the approach chosen by the adviser individually. The 'problem solving approach' has been a very characteristic element in the work of Dutch extension for the past decades. Therefore, one may hypothesize the main menu to reflect the agency's style of work as well. In fact, the main menu reflects both a considerable standardization in the extension approach of the Dutch extension service and considerable 'degrees of freedom' for the extension officer to create situation and client specific adaptations of the advisory process.

The evidence presented with the main menu reinforces, in my view, some of the conclusions we were able to draw from the study of the information portfolios earlier on. It confirms the *professionalism* of agricultural advisers and the way they organize their approach around clusters of relevant issues. The main menu also elicits the way advisers select documentary information to support certain clusters of issues and tasks more than

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[2] Not all fields are necessarily deemed relevant: The interviews didn't produce relevant issues or questions for those fields marked 'X' in figure 3. This in itself may suggest interesting questions, which I will not further explore here.

[3] The numbers marked '#' allocate the documentary pieces of information found in the 'standard portfolio' to specific knowledge fields.

others. Finally, the main menu illustrates the wide scope of knowledge and information advisers use to do their job. It shows *inclusive* thinking, in order to be able to adequately address common-day problems together with farmers. And it shows the flexibility advisers must master to address a variety of topics, in line with evolving farmers' interests. It demonstrates the advisers' activities go far beyond simply 'transferring' a particular technical option or message.

The 'main menu' on manure storage

Knowledge and information types: *Fields of analysis:/*	*Farm I:* *current situation*	*Farm II:* *management strategy*	*Context I:* *Technical developments*	*Context II:* *Agricultural policies*	*Context III:* *Market opportunities*
Reconnaissance/ opinion formation	what is/ has been done already? #1	what objectives? continuity?	alternatives? #2	laws, regulations, norms, subsidies #3	opportunities? now? future?
Problem definition	actual storage capacity & production #1	solutions already applied? #3	norms #1	X	sales possible? where?
Comparison of alternative solution strategies	costs/benefits #1	closeness-of-fit	alternatives?	subsidy? #2	timing, costs benefits #2
Comparison/choice of feasible solutions	costs, purchase, maintenance	X	guarantees supplier #2	X	X
Follow up on implementation	construction process	X	X	correct application of rules?	X

Figure 3: The 'main menu' for *on-farm storage of animal manure*: knowledge fields relevant to generating a situation- and farm-specific advice on on-farm manure storage[4] (Engel, 1989a).

[4] Boxes in the matrix represent knowledge fields (knowledge type x field of analysis); marked with '#' is the number of documentary pieces of documentary information, relevant to that specific knowledge field, that was found in the 'standard portfolio'; marked with an 'X' are those knowledge fields not discernable as seperate issues during the interviews, although, from a logical or technical point of view, they might well be relevant.

Reviewing the number of documentary pieces of information supporting each of the knowledge fields (marked '#'), we may appreciate that some, like policy trends, and the evaluation of the current farm management strategy, are strongly supported with three documents each. The reconnaissance of the farmers' management strategy is not supported by documents. Apparently, advisers expect (1) some issues to merit more elaborate and technical treatment, and (2) some information to have to come from the farmer without much input or structuring from the adviser. At the other hand, some issues are quite simple and clear cut, as the definition of the 'actual production and storage capacity'. Here one sheet with the procedure to calculate these values suffices to support the issue. A spreadsheet could do the same job. Such findings confirm our earlier conclusion that advisers select very carefully the pieces of information they carry with them, in view of their immediate usefulness during (a part of) the advisory cycle.

A more general conclusion may be that any farm adviser operate a 'basket of issues', well-organized to facilitate its use, well rooted in his or her understanding of farming and well-stocked with information of different types in order to be able to complete the large number of advisory cycles he or she attends to annually. The 'basket' is problem-oriented and specifically designed to cope with a job they only know too well. It provides an amount of *flexibility*, which enables them to provide a tailor-made service to their individual clients, and at the same time, it provides a *structure*, focusing their attention on central issues to enable them to work systematically and efficiently. It will be very difficult for any formal information planner, to come up with a better alternative.

The head menu also mirrors a limitation of focusing on the 'advisory cycle' in a very particular case in order to trace the use of knowledge and information by farm advisers: the study didn't specifically take into account 'extra-advisory-cycle' activities of farm advisers, such as writing brochures, leaflets, reports, etc. Issues involved in drawing policy documents, writing didactic materials, exchanging information with colleagues are touched only if directly relevant to the particular advisory cycle studied. This drawback had to be accepted, however, in order to benefit from the close relationship to actual practice which is one of the strong features of such a 'process approach'.

Knowledge transfer or networking?

During the case study, another issue presented itself which seemed of particular relevance to the social organization of innovation. To describe the way knowledge about outside storage of animal manure was generated and exchanged amongst the relevant actors in the North East of Brabant, the use of the concept of 'knowledge transfer' resulted in a gross oversimplification of the activities of the extension service. Those activities, as identified from the interviews, could better be described as a continuous process of client and practice-oriented *integration of knowledge and information from a variety of sources* at all organizational levels. The result of this process at each level are concrete products: an advice, a letter, comments on a draft policy document, a technical note, a recommended scheme for spreading manure on farms according to the current regulations, an experiment to reduce the volume of manure production at the farm level, etc. Each of these products is directly relevant to the work of one or more of the participants in the processes at the various levels. In each of them, location-specific, regional and national policy related knowledge are integrated routinely, as well as technical and economical disciplinary and sector knowledge.

The interactive mechanisms by which such integration is achieved vary. Documentary information and telephone conversations play an important role at every level. At the level of communication between farmers, farm advisers and subject-matter specialists, closest to agricultural practice, farm visits, individual coaching and service meetings are most frequently mentioned. At the level of interactions between heads of service, subject-matter specialists, researchers and policy makers, project groups or otherwise temporary task groups are mentioned most. To integrate both levels, regional or national task groups are mainly used. In such task groups people from all levels in the organization are included. It strikes the student that, the more one approaches the field level, the more interpersonal communication mechanisms seem to play the dominant role in knowledge integration.

Common to these mechanisms is the creation of joint learning opportunities amongst people who possess different types of knowledge relevant to the subject at stake. They are joined together in a task-oriented communication setting, where the qualities of each of them for designing whatever product is intended can be taken advantage of. In fact, the analysis of such settings can better be conceptualized as a temporary intensification of communication network articulation around a specific issue, than as a transfer of knowledge and information. Intentionally, articulation is created between already existing networks in order to make use of the various relevant insights developed within each of them. The reliance on person-to-person contacts, or even confrontations, seems another characteristic common to such integrative mechanisms.

What is commonly held to be a process of knowledge transfer, can therefore better be understood as a step-wise integration of knowledge, information, ideas and experiences by means of temporary, task-oriented network articulations between relevant actors. Entering such settings, each of the participants brings the relevant ideas and insights generated within his or her more permanent networks. From each of such events each of them takes away new building blocks to support their own work as well as the specific product or service which has been designed by the task group, reflecting the insights of all those involved. Not surprisingly, people who manage such 'projects' in the Dutch extension service often seem more powerful than those who simply manage the 'line'.

3.3 CASE B: the agricultural communication network in Asten, North Brabant[5]

This second case addresses the use of information sources by agricultural producers. It reviews part of the results of a baseline survey done as part of the introduction of AGROCOM videotex services in the municipality of Asten, in the Province of North Brabant in the South of The Netherlands. It shows the diversity of sources farmers use to obtain their information and the different roles various parties play in satisfying the farmers' diverse needs for information. Farmers are shown to make use of a wide-spread, diverse network of sources in order to obtain the information they need to manage the

[5] The data presented have been generated as part of the baseline survey done for the AGROCOM Evaluation Study on the use of videotex in agriculture (Van Dijk, Leeuwis and Engel, 1990); these paragraphs are adapted from Engel, 1993.

farm. This network, however, is by no means amorphous. Different actors engage in different types of relationships, with producers and amongst themselves, each of them offering distinct types of support including information. Within the network, professional actors try to find their own 'niche'.

The survey relied heavily on qualitative research methods, including open-ended questionnaires. Its design benefitted from a previous case study amongst farm advisers (Engel, 1989; see above). Two main types of information were distinguished: firstly, information directly applicable to decision-making at the farm level; this in turn was subdivided into strategic and operational farm management information. Strategic information concerns information with direct relevance to answering questions, and addressing issues of a tactical and strategic nature, in the (near) future. Operational information includes information with immediate relevance to the daily management of the farm business. Secondly, more general information related to developments within the farm's socio-political and economic environment; this was taken to be of three main subtypes: technical, concerning technical and scientific developments, political, concerning rules and regulations affecting farm operations, and market-related, concerning the development of prices, consumer demands, national and international developments. Moreover, four different types of use of information were recognized[6]: (1) the use of information for opinion (or 'image') formation, to keep abreast with what others are doing, (2) the use of information for determining actual problems, or the actual need for a specific intervention in farm management, (3) the use of information for the comparison of alternative solutions or interventions, and (4) the use of information for implementing a solution or an intervention after being selected as the most appropriate one.

During interviews, as much as possible, concrete examples of situations in which the use of information could be expected to play an important role, were taken as a point of departure. Farmers were asked to name the sources of information they use regularly in such situations, the types of information they obtain from these sources and the way it was put to use. These data were subsequently organized to reflect the top 5 most important information sources, on the basis of the number of times particular sources were mentioned by the respondents. For each type of information and for each type of information use respectively, the results are presented in table 1 and 2. The numbers represent the ranking of the sources according to the number of times a particular source was mentioned, "1" being the top-ranked information source.

Sources and types of information

When looking at table 3, the diversity in sources of information used by farmers catches the eye. Even if only the top 5 sources in every category are included. Apparently, over time farmers and horticulturalists in the region of Asten have developed a diverse, and multi-facetted communication network to enable them to obtain the information they need.

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[6] In hindsight, this reflects an interesting omission: the use of information as an input to produce new information was not included. Yet, Dutch farmers through different record keeping activities, management software, etc. produce a lot of information for further analysis. Clearly, our decision to follow too closely the traditional phases of a problem-solving/decision-taking model affected our analysis. In later research, we corrected for this by introducing a learning cycle as a way to hook up knowledge and information use to daily practice (Stolzenbach, Engel and Leeuwis, ongoing).

The *farm journals* stand out remarkably. According to the producers, they cover a broad spectrum of information needs very adequately. Though not very surprising in the Netherlands where they traditionally occupy a very important niche in the agricultural information market, this result suggests the farm journals to be a *carrier wave* of sorts, fulfilling a very basic role in facilitating the exchange of agricultural information. By regularly reading their journals, farmers and horticulturalists feel they keep ahead of relevant developments taking place that affect agriculture.

Table 3: Top 5, most used information sources, per type of information (Van Dijk, Engel, Leeuwis, 1991).

Type of information: Source:/	*Strategic*	*Operational*	*Technical*	*Policy*	*Market*
farm journals	4	3	1	1	1
product extension[1]	1	2			5
independent ext.[3]	5	5		5	
colleagues[4]		4	5	5	
accounting bureau	1			5	
service extension[2]		1			
agricultural bank	3				
research institute			1		
agric exposition			4		
manufacturers[5]			3		
government agencies				1	
farmer's organizations				4	
dailies				3	4
buyers[6]					1
teletext					3

[1] product extension, is the personal of companies that sell inputs to farmers, like animal feed, chemicals, etc., who at the same time, provide technical advise.
[2] service extension, are people, like veterinary doctors, who provide a service, as well as technical advise to farmers.
[3] independent extension, is the recently privatized, former Government extension service.
[4] include informal, and formal contacts through study clubs.
[5] includes manufacturers, and sellers of equipment.
[6] includes auctions, and other buyers of agricultural outputs.

A second category of what we may call *farm visitors* seems to stand out as well. These are the ones who regularly visit the farm or have personal contacts with the producers. First and foremost, they are the ones connected to the sales of inputs. Large animal feed cooperatives or companies in The Netherlands generally operate an extension service of their own. Their philosophy: without the correct management, our feeds will not generate the desired benefits. Such extensionists, apparently, become trusted advisers as far as

farm operations and strategy is concerned. The same seems to hold for veterinary doctors, and other on-farm service delivering people, although according to our data, they seem to be more focused on operational matters only. Farm advisers of the independent extension service, formerly of the Government, and colleague farmers, through informal contacts and through study clubs, play an important role as well[7]. With respect to all of these farm visitors, frequent personal contacts facilitate the building of a strong relationship of mutual trust, and shared interests. The importance of this for information transfer is well established in extension literature (Van den Ban & Hawkins, 1988; Fearne, 1991). At the same time, interpersonal communication facilitates *custom-made* advice, fitting closely the particular situation of the farmer, and his/her farm at a particular moment in time.

A third category of information sources, apparently, is much more specialized. These sources are consulted by the farmers when they are in need of a specific type of information. Some of them are considered very important indeed. Yet, they are not considered of the same or similar importance for other categories of information. Farmers and horticulturalists, when in need of market information, go straight to the source, the buyers. The same applies for information on rules and regulations, or policies: Government agencies are consulted. For first-hand information on technical developments, they consult the experimental station. In this group we also find the first "electronic" means of communication: teletext. Its market information, mostly on prices, is valued.

Table 4: Top 5, most important information sources per type of information use (Van Dijk, Engel, Leeuwis, 1991).

Type of information use: Source:/	*Image formation*	*Determ. of needs*	*Comp. alternatives*	*Implem. solutions*
Service extension[2]	2	1	3	1
Product extension[1]	5	2	2	2
Colleagues[4]	3		5	
Accounting bureau		3	4	
Independent ext.[3]		4		4
Manufacturers[5]		4	1	
Farm journals	1			
Dailies/mass media	4			
Buyers		4		
Government				3
Farmer's organizations				5

for notes: see table 3.

[7] Our sample reflects the importance of animal production - dairy, pigs, and poultry - in the area. Therefore, our data do not permit us to confirm whether the same conclusions hold true in dominantly field cropping areas. We feel quite confident, however, they hold for modern greenhouse horticultural areas.

Sources and type of information use
When we look at table 4 and relate the sources of information to the type of use they are considered most relevant to, again, diversity is a striking feature, as well as the roles farmers assign to different sources. A remarkable feature is the broad influence of product and service-related advice. These advisers are tied into all mayor decision-making processes at the farm level, it seems. Colleagues and independent extension advisers, as well as the accounting bureau and the manufacturers of farm technology are consulted in a more limited, more specific manner. Again, the role of the farm journals is evident. Although they do not appear to play a role in other forms of information use, their role in general opinion formation, in maintaining a vision of what is going on is pivotal. The producers rely upon the farm journals, with their broad coverage of issues to be aware of things, to stay on top of actual developments which may affect their operations.

The agricultural communication network
The networks articulated by the farmers and horticulturalists in Asten appear as complex, multiple networks of relationships which facilitate the exchange of knowledge and information of different types, for different purposes. Different subsets of actors generate and exchange knowledge and information with regard to inputs and farm equipment, or farming operations, or strategic planning, or sales of farm produce. Farmers themselves, but also farm journals and to a lesser extent the different farm visitors, play an active role in articulating such sets into networks. Furthermore, each of the actors seeks access to specific sources for specific types of information to be used for specific purposes. Clearly, active communication by relevant social actors helps shape the networks. Of course, farmers themselves appear as an important source of knowledge and information as well.

We may visualize the agricultural communication network articulated by the farmers in Asten, North Brabant, as depicted in figure 4. In the centre the farmers who maintain communication relationships with other actors, while managing and developing their farms. Their most apparent characteristic seems to be they are permanently *learning*: managing, interpreting and incorporating knowledge and information from a large number of other actors into the way they go about their daily work. A first "layer" of information sources, most directly linked to farm operations and strategy, is the one composed of those who regularly visit the farm. I labelled it the *advisory line.* The second "layer" includes those information services which reach out to the farm, without actually sending people there. This may be called the *information line.* The third "layer" are those sources of information which are available to the farmer, if and when he or she accesses them. Let's tag to this one the label *documentation line.*

Advisory line actors establish long-term personal relationships of mutual trust and shared interests with the producers. Their information support is mainly geared towards farm operations and strategies (table 3), and multi-functional (table 4). Their advice is directed at the specific situation of the farmer and his/her farm, at a certain moment in time. It is in optima forma "contextually sensitive". To obtain such a result, advisers target their information at individuals, not groups, at specific types of farms, not all farms, and, most probably, at specific types of individuals, not all individuals. Their information is custom-made, very specific and to-the-point, and easily insertable in day-to-day farm practices. Every adviser, therefore has necessarily a limited number of farms and farmers he or she

can attend. The time and energy they spend per client is high.

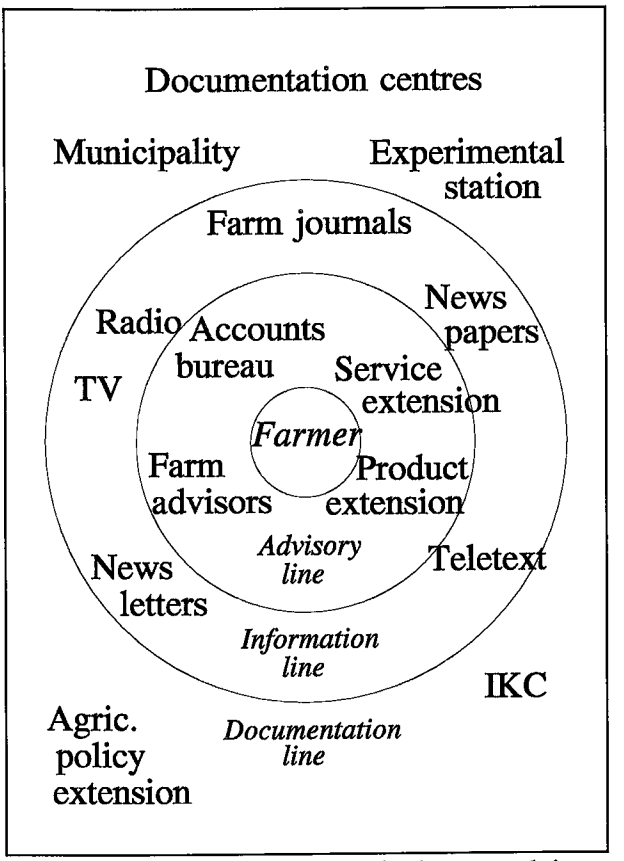

Figure 4: The agricultural communication network in Asten, the Netherlands.

Information line actors provide a broad information offering, covering various aspects related to farm management and in particular to the rapidly changing farm environment (table 3). In order to be able to do this they make use of mass communication media, which are directed at specific audiences of producers, horticulturalists, floriculturalists, dairy farmers, etc. Their information offering is oriented towards the needs of such an audience, through studying the target audience, and following up actual use of information. The information offered is client-oriented, yet not custom-made. The producer him or herself will still have to make a considerable investment in processing the information, selecting the relevant pieces, and integrating these into his or her farm management, and strategic thinking. Second line actors mostly specialize in supporting one type of information use, more in particular image formation, to help producers staying on top of things (table 4). They often act in support of first line or third line actors, publishing their articles, and advertising the benefits of their services, or products. Many first or third line actors in Asten publish their own newsletter, or weeklies, which might be included in the second line of the agricultural communication network. These, however, were not rated by the producers amongst the first five in any of the categories.

Documentation line actors, generally, possess a specialized kind of knowledge or skill. They know what there is to know concerning technical innovations in a certain type of farm, they can borrow money, give financial advise, keep the books, manufacture a certain machine, build a certain installation, know official rules and regulations, or are representatives before municipal or national bodies. They do not, normally, visit the farm on a regular basis. Yet, they provide information services to farmers, as well as first and second line actors. The type of information they provide depends upon their expertise, not necessarily upon the needs of a certain specific target audience of farmers. They represent

the "supply side" of the information market. As a result, they are both specialized in the type of information they provide, and in the type of information use they support. Also, their ability to provide contextually sensitive information is necessarily limited. That's why they mostly rely upon first and second line actors to "translate their messages". Third line actors, generally, use specialists, supported by large databases, and official publications in general mass media. Sometimes the databases can be accessed directly by second and first line actors or farmers, but mostly an 'information specialist' or intermediary is required to provide access to various, often incompatible (sic!) databases available.

Communication networks as value-added networks

As I have shown, the agricultural communication network in Asten is a highly diversified universe displaying a variety of social actors specializing in distinct types of support. What is more, their support is targeted to very specific individuals, groups, or categories of producers. In other words, none of the actors is "just a pipeline", pushing through messages from one end to the other, without adding value to them. Each party within the network adds a specific value to its contributions in order to make these useful to its users. From our baseline survey, we may draw some preliminary insights in what, exactly, is the value different actors add. At least we may outline some of the factors critical to the success or failure of social actors who intervene in the different *lines of action* we have distinguished in the network. I will do this by reflecting upon the expectations which exist on the part of potential users of the services or information products actors contribute to network operations (table 4).

What do users expect, when they access a *documentary* information service? Our baseline study suggests at least two crucial factors: they feel this particular documentary service will provide them with as complete as possible a picture of what is available in a certain field, and relevant to them, and they feel they can rely upon the source to provide them with information that stands true, in negotiations with other parties involved or in case of unexpected consequences of the use of the information. Take the case of a database on policy information concerning manure storage. After having accessed it, the farmer would expect to find all the details on laws and regulations, concerning his or her type of farm. It would be of no use to him or her, when some details are there, and others not, or when the database provides figures which have already been changed in the meantime, so that in negotiations with the municipality about building manure storage, his figures would not stand. At the same time, the farmer would not expect anything from the database unrelated to manure storage. He or she will not get frustrated if no information on tomorrow's weather conditions is provided. Also, this particular database would not be accessed very frequently, as the planning for building manure storage facilities is not something he or she does all the time. In fact, producers would probably be happy to obtain this type of information through a third person, a farm adviser for example.

The same way, one may ask what moves farmers to read farm journals, or, in more general terms, access sources in the *information line.* From our data, and additional views collected during the interviews, we suggest what producers most seek to establish through these sources, is information security. Information line sources should cover a broad range of topics, providing enough information about them to stay ahead of things, technical developments, policy changes, market trends. At the same time, as producers

are accustomed to use various media for this purpose, they are very selective. Messages should therefore be easily recognizable, and directly relevant to their situation, as they themselves perceive it. Information produced by sources in the information line is of such a general nature, yet so important to keep track of, that to access it producers rely on *scanning*. Only a few articles, or parts are read, or taken in with care. Farm journals, dailies, etc. cater for this by adjusting their lay-out, facilitating in multiple ways quick access to those parts a particular producer might think is relevant. In other words, producers invest regularly in accessing information line sources. Per source they spend the time they think is needed to extract the relevant bits. Frustration creeps in when, in spite of considerable time investment, one misses out on relevant new developments, or the source doesn't seem to provide the type of information you expect to find in it.

Actors who operate in the *advisory line*, again, are to reckon with different expectations from the side of their clients. Private or government agents alike, their communication relationship with the producers is based upon mutual trust amongst individuals. From the part of the agent, this trust can be based on efficient service delivery, good products, relevant opinions, and good advice, probably in combination with a warm personality, good communication skills, and efficient back-up by a company or organization, to name just a few. However, no product or advice is 'good', nor a delivery 'efficient', unless it is custom-made, specifically tailored to the situation, the personality, and the problems of this one client in particular. Moreover, no barriers should be experienced by the producer when integrating it into his/her daily operations and farm management.

Table 5: Some critical issues to be considered by actors intervening in agricultural communication networks

Position in:	*Critical issues:*	
Advisory line	situation specificity	immediate applicability
Information line	recognizability	relevance
Documentation line	completeness	formality

3.4 Some preliminary conclusions from the case studies

Both case studies illustrate a number of basic characteristics of communication for innovation in practice. It is problem-oriented, situation-specific, and requires a high degree of professional information processing and use. Information sources are diverse, rich, and include a wide range of interests. Information is made available in such a way as to permit autonomous selection, interpretation and adaptation, both in form and content, to current local agendas. The mechanisms found to support communication for innovation provide learning opportunities to those participating. They are organized in such a way as to stimulate associative, inclusive thinking on relevant issues.

This interpretative or 'soft' nature of communication for innovation contrasts sharply with the normative or 'hard' character of communication for administrative control. The

argument arising is, in fact, very similar to what has been written about the management of innovation in large companies (cf. Mintzberg, 1983; Moss Kanter, 1983). Communication for innovation is to be distinguished from communication for control. The latter requires elaborated agreements and standard procedures, the former a flexible, sometimes redundant approach to information management. While certain characteristics, like a strong accent on hierarchy and compartmentalization, tend to prove fatal to innovation, they might be essential to effective and efficient administrative control. Moreover, communication for innovation can be seen as a purposive activity. Social actors in agricultural innovation theatres develop professional strategies to generate and exchange knowledge and information. Such strategies are closely integrated with their daily practice, as communication for innovation is their job. At the same time, it is obvious that communication is embedded in more comprehensive social relationships amongst the actors involved. Communication can only be understood as one aspect of such relationships as develop between farmers, veterinary doctors, district extension managers, farm advisers, specialists and other social actors in innovation theatres.

In addition, it seems very hard, on the basis of this evidence, to uphold the notion of 'transfer of knowledge', even for the activities of extension services. In the first place, all social actors in innovation theatres seem to appear as users as well as sources of knowledge and information at the same time. This provides a strong argument in favour of the use of 'learning-in-practice' rather than 'knowledge utilization' as a concept to study innovation at the individual actors level. Secondly, the evidence of the case studies strongly supports the idea that innovation in agriculture is not the work of individual actors, but should be taken as a social process. Each of the participants, consciously or not, contributes a specific piece to the jigsaw puzzle of agricultural innovation. In this, multiple and diverse communication networks play a decisive role. Such communication networks do not only surge spontaneously, but to a certain degree can be managed or facilitated by the intentional design and implementation of strategic 'network articulations' in or between organizations. Thirdly, the notion of 'knowledge transfer' seems clearly at odds with our findings that agricultural communication networks are 'value-added networks', in which each social actor contributes his or her particular competence to the functioning of the network. The step-wise, task-oriented integration of different strands of knowledge and information generated amongst social actors in innovation theatres, can better be understood as the result of networking efforts amongst sets of actors who share an interest in a common concern or issue. Again, the evidence underscores that such communities of interest may surge spontaneously, yet may also be created in view of certain desired outputs.

4. *Impact of inter-institutional coordination in Nariño*[1]

4.1 Introduction

Poor institutional performance in support of innovation by farmers is often attributed to weak inter-institutional coordination. The underlying assumption is that a higher level of coordination, collaboration and communication leads to improved institutional performance and impact (Kaimowitz et al., 1990). Better linkages, for example between research and extension, are expected to contribute. However, the empirical evidence supporting such claims leaves much to be desired. One reason is that not only research-extension linkages are important (see for example: Merrill-Sands & Kaimowitz, 1989). Links with farmers, between farmers, with industry, between industries, with commercial marketing companies, with policy making bodies, and between these, might all be important. So, how to isolate a direct connection between inter-institutional coordination and performance? Another reason is that contextual factors may interfere and frustrate even the best of institutional interventions. How to account for those?

In the Nariño Highlands, the Andean Region in the extreme south of Colombia, within the time-frame of the study, I believe a number of rare conditions were fulfilled which helped reduce such difficulties: (1) the theatre has been subject to a relatively stable agricultural policy environment during a ten year period; from 1975 to 1985, peasant agriculture in the Nariño Highlands received permanent support; hence, institutional interventions showed a considerable degree of continuity; (2) with respect those domains of peasant agriculture considered in this study, institutional actors played a dominant role during this same period; commercial and/or non-governmental actors were not particularly focused upon peasant producers; (3) a set of data was available to evaluate agricultural production in the region which, although not fully reliable in details, makes it possible to lay out general trends in productivity and production.

Therefore, in this case study I will attempt to shed some light upon the relationship between institutional performance and impact in terms of agricultural innovation. My central questions are three: (1) Can a direct link be argued between inter-institutional coordination and innovative impact? (2) What issues seem to play an important role in forging effective institutional performance? And (3) which contextual factors are relevant? In addition, I will ask myself which specific linkage mechanisms, in this case, made a direct contribution to improved institutional performance in agriculture, if any.

In order to answer my questions, I will focus on 'agricultural innovation', 'system integration' and 'sustainability of institutional performance'. In order to assess *agricultu-*

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[1] This chapter is adapted from Engel, 1990a: *The Impact of...*

ral innovation I will concentrate on productivity per unit of land mostly. Under the given conditions and considering the technological options open to peasants during the period, I consider it reflects best the use of improved technologies in agricultural production. Our definition of *integration* includes both formal and informal, financial, administrative and informative links between core institutions. It includes such mechanisms as coordinated plans of action, regular coordination meetings, collaborative task groups, and the regular exchange of information and materials. It also includes the provision of resources by the integrated rural development programme (DRI) for operational and staff costs, and the Colombo-Dutch bilateral technical assistance project (ICA-CCH) for key activities, additional staff, transport and/or materials in priority areas. Informal links are broadly defined as the personal contacts between colleagues and incidental exchanges of information; they are rarely concerned with staff or materials. To address *sustainability of institutional performance*, I will ask myself what chances the institutions have to maintain their level of performance when conditions change.

We open this section with a sketch of agricultural performance in the Nariño Highlands from the seventies to the mid eighties. I show that, after the implementation of the Integrated Rural Development Programme in the mid 1970ies, and particularly in the 1980-86 period, there was a significant increase in production in some agricultural domains, whereas in others production remained stagnant. I then review the core institutions which were involved in the development and transfer of agricultural technologies in the region. I continue by outlining the level of integration between these institutions and by examining the role of different linkage mechanisms in facilitating integration within specific agricultural domains. I will argue that increased system integration did indeed coincide with increased impact in terms of agricultural performance, and that particular linkage mechanisms contributed effectively to achieving higher levels of system integration. Besides, I will highlight the role played by leadership and strategic consensus. Relevant contextual factors are discussed as well. Finally, I look into the issue of sustainability of institutional performance in the post-1985 period.

4.2 Agricultural performance and innovation

Small, mixed farms, 85% of which are under 5 hectares, are the predominant source of agricultural production in the Nariño Highlands (URPA, 1987). There exist a limited number of large, commercial farms in the region as well. The main crops grown by Nariño's peasant farmers are potatoes, maize, beans, wheat and barley; the two other main agricultural activities are dairy farming and the production of curies, a species of guinea pig. As result of difficulties arising when interpreting production trends, particularly due to extreme market conditions, potatoes and barley have not been considered for the present analysis.

Until the mid 1970ies, the Nariño Highlands played only a marginal role in the national economy in terms of food crop production. The crops produced in the region didn't participate in the dynamic production increases recorded nationally. Yet, over 50% of the region's population depended upon agriculture for its livelihood, compared to 20% nationally, and agriculture accounted for about 30% of the region's output. In all agricultural domains, apart from potatoes, yields were stagnant. Development of the

predominantly peasant economy in the Nariño Highlands was hampered by lack of capital and expertise. Low levels of labour productivity, poor yields per hectare, and inadequate marketing facilities contributed to lack of growth and an economy geared towards satisfying local demand with few opportunities for peasant farmers to improve their situation.

Halfway the seventies, Colombia abandoned large-scale land reform as the main focus and developed a policy aimed at the modernization of peasant agriculture through state intervention. It defined peasant farmers as farmers who owned less than 20 hectares of land, who did not have considerable capital resources and whose major source of income was agricultural production. The two main vehicles for implementing this policy were the Integrated Rural Development Programme (DRI) and the National Food and Nutrition Plan (PAN). The objectives of these programmes were to enhance the role of the peasant farming sector in the national economy and to improve the living standards of the rural population. Emphasis was placed on introducing new food production technologies, improving marketing facilities and providing the basic rural infrastructure. The responsibility for developing and introducing new technologies was assigned to the Colombian Agricultural Institute (ICA). The DRI programme was initiated in 1974-75. In Nariño, the ICA took up its task in cooperation with other government institutions, including the Agricultural Bank (Caja Agraria) and with the Colombo-Dutch bilateral assistance project (Convenio Colombo-Holandés).

The level of agricultural production in Nariño during the ensuing decade can be taken as a measure of the effectiveness of agricultural institutions in bringing about technological change. All new agricultural technologies made available to Nariño's peasant farmers were developed and introduced by or in close cooperation with ICA and DRI; and most peasant farmers relied on DRI credit to incorporate new technologies into their farming operations. Moreover, DRI records suggest that government institutions indeed achieved a considerable coverage of the total peasant population during this period. During the period, production and yield figures were compiled twice by the Regional Agricultural Planning Unit (URPA, 1983 and 1987). Although there may be some disagreement on the details of these studies, little doubt exists amongst experts as to their accurate reflection of the general trends for agricultural production in the Nariño Highlands (ICA-CCH, 1984). Without leaning too much on such figures, I have taken them to illustrate in a general sense, the development of agricultural production in the region. In the following, I will briefly outline the results per domain of agricultural production relevant to the study.

Maize and beans. The acreage under maize decreased in the seventies, and then stabilized in the early eighties. The beans acreage increased significantly between 1980 and 1986. In both cases, however, there was a low level of adoption of improved technologies and yields stagnated.

Wheat. Wheat yields declined in the seventies. However, in the 1980-86 period a 60% increase in yield, combined with a 45% increase in planted area, more than doubled output. A large part of the new area under wheat may have resulted from a substitution of wheat for barley (URPA, 1983).

Dairy. Milk production rose slowly in the seventies, and then increased considerably in the early eighties. This trend can be attributed partly to an increase in the number of productive animals (about 30% between 1973 and 1983), and partly to increased production per head (about 60% over the same period). There were several reasons for this growth. Favourable government credit schemes made it attractive for peasants to enter dairy farming. Milk collection, transport and processing received a boost by the establishment of a regional dairy cooperative, COOPROLACTEOS, which increased its daily raw milk intake from about 10,000 litres in 1980 to 35,000 in 1986. The gate price for raw milk increased steadily between 1977 and 1984, making milk a stable source of family income. And finally, improved pasture seeds were introduced. Institutional sales of such seeds to peasant farmers alone, accounted for some 800 newly established hectares of improved pastures amongst some 1,000 farmers (ICA-CCH Annual Reports).

Curies. The development of improved technology for curí breeding and husbandry had a significant impact on the region's curí producers, many of whom were women. In 1980, only a few producers used improved technologies. During 1985-87, however, according to the Financial Corporation in Support of Cooperatives (CORFAS) - a non-profit private organization - 236 peasant women obtained credit to enable them to adopt improved technologies. In addition, 40 male farmers obtained credit through the DRI/Agricultural Bank programme for the same purpose.

Whereas the seventies were characterized by stagnation in all domains apart from potatoes, during the early eighties a significant increase in agricultural production was achieved in three domains - wheat, dairy, curies - while in two domains - maize and beans - production remained stagnant. Given the close relationship which can be assumed, under the given conditions, between government intervention, the introduction of improved technologies and production increase, this would suggest that in the case of wheat, dairy and curí production, institutional support to small-holder innovation was effective, whereas in the case of maize and beans it was not. For integration amongst core institutions to be considered key to achieving impact in agricultural innovation, during this period such integration would have to be effectively found during this period, whereas in the latter two it would not exist or be ineffective.

4.3 Agricultural institutions and their activities

The actors in the agricultural innovation theatre in the Nariño Highlands were many. However, not all were equally relevant to the development and introduction of improved technologies with peasant farmers. Several entities were involved in specific tasks, some of which have already been mentioned like COOPROLACTEOS. However important, its contribution was limited to a specific group of peasants, dairy producers. The cooperative, during the period studied, played no role in the general orientation of institutional efforts. The contribution made by the National Service for Vocational Training, SENA, was limited to training farmer leaders, farmers and operators, without much follow-up. The ICA-UNICEF program collaborated with CORFAS in organizing curí breeding and production among peasant women. The Colombian Agrarian Reform Institute, INCORA, provided organizational and some technical support to a few farm cooperatives. The University of Nariño supported efforts in certain domains.

The institutional actors who played a more general role were ICA/Research, ICA/Extension, the Regional DRI Office, the Agricultural Bank and the Colombo-Dutch project, ICA-CCH. Their mandate concerned the introduction of improved technologies in peasant farming, thereby raising the living standards of the peasant population of the area. The *Regional Centre for Agricultural Research* was established in Obonuco in 1946 and since 1963 has been responsible for ICA research activities in Nariño. The *ICA District Extension Offices* in the Highland region were two: one in Ipiales, at the southernmost border of the province, and one in the provincial capital, Pasto. Besides, in both districts field offices were maintained in various municipalities. The *Regional DRI Office*, located in Pasto was responsible for implementing the Integrated Rural Development Programme in Nariño. The *Caja Agraria* through its main office in Pasto and its subsidiary offices in all the municipalities of the province, was the main supplier of agricultural credit; all DRI agricultural loans to peasant farmers were channelled through its system. The *Colombo-Dutch project ICA-CCH* was initially based with ICA/Research in Obonuco but later with ICA/Extension in Pasto, and operated from 1974 to 1985. In the following I will briefly review the main functions provided for by these institutions with respect to innovating peasant agricultural production in Nariño.

Research

The research programs carried out by ICA/Research at the Obonuco station between 1966 and 1987 are indicated in table 6. All programs were associated with national ICA research programs and some were replications of research carried out at ICA's National Research Centre at Tibaitatá (ICA, 1966). In an evaluation carried out by a visiting Dutch team in 1973, the dairy research program scored high in terms of on-station performance but low in terms of disseminating technology to peasant farmers (Oosterberg and van der Kuip, 1973). Although the station continued to conduct research on the problems faced by medium- and large-scale producers as part of the national ICA dairy research program, it started to place more emphasis on adapting research results to meet the needs of small-scale producers in Nariño. With the support of ICA-CCH, an intensive small dairy farming unit was established in 1975.

Table 6: Research programmes carried out at the ICA Regional Centre for Agricultural Research.

Program	*1966*	*1982*	*1987*
Cereals	*	*	*
Maize	*	*	*
Dairy production	*	*	*
Pastures and fodder crops	*		*
Potatoes	*	*	*
Grain legumes		*	*
Intercropping		*	*
Horticulture		*	*
Fruticulture		*	*
Soils	*	*	*
Agricultural machinery	*	*	*
Entomology	*	*	*
Phytopathology	*	*	*
Agricultural economics			*

Sources: ICA, 1966; ICA/Extension Reports, 1982, 1987.

The efforts undertaken by ICA/Research in wheat, beans and maize focused mainly on breeding and selecting varieties. A large number of varieties have been introduced since the 1960ies, many of which have been accepted by Nariño's farmers. Research on potatoes has been conducted since 1966, and a number of more productive varieties were introduced. The ICA-Nariño variety which was developed at the regional station became one of the most widely used varieties in the Nariño Highlands. ICA/Research was also actively involved in producing seed potatoes, both on-station and with selected peasant producers. In response to both regional and national demands for new technologies, ICA/Research embarked upon several new programs in the early eighties, including grain legumes, intercropping, horticulture and fruticulture. The agricultural economics research program was started in 1985, to enhance the practical applicability of research recommendations through farm budget evaluations. The disciplinary programs on soils, farm machinery, entomology and phytopathology are supportive in specific problem areas.

Table 7: Communication Plans for Technology Transfer (PCTT) in operation in the Pasto District during 1983.

PCTT subject/	*municipalities* #	*villages* #	*peasants* #	*publications* #
Dairy	7	18	190	820
Wheat	2	9	250	550
Curies	3	6	96	4700
Maize	5	8	235	0
Beans	4	7	270	120
Potatoes	3	12	280	720
Fruits	7	14	270	1550

Note: the number of peasants refers to those directly involved in the activities of the programmes; the number of publications refers to all booklets and/or brochures produced; not all of these were necessarily used immediately or within the course of one PCTT.
Source: Annual Report ICA-CCH, 1983.

Extension

During the early seventies, ICA/Extension operated as part of the Regional Rural Development Project, and focused on organizing and supporting farmers' groups. This approach was abandoned in 1975 and the extension service reverted to undertaking individual farm visits and providing credit assistance, backed by DRI; inevitably, this resulted in reduced coverage. In 1981, the ICA Communication Department developed a methodology aimed at improving the effectiveness and efficiency of advisory services to small farmers. Known as the 'Communication Plans for Technology Transfer', or PCTT methodology, it focused on adequate planning, preparation and implementation of multi-media extension programs and provided the means to clearly define the extension objectives, target groups, activities and program contents. It added group events, meetings and demonstrations to individual visits, whereas the systematic planning of extension

events with farmers in a village was another key element. Individual technical assistance and credit services continued to be of central importance.

Between 1981 and 1983, nine PCTT plans were prepared and implemented. Their design was in the hands of the district staff and field workers with the support of regional and national ICA Communication Department. The main peasant agricultural activities were covered. Improved planning and preparation, and the systematic involvement of subject-matter specialists, permitted the plans to be backed up by a continuous production of high-quality extension materials, such as slide shows, booklets, brochures, posters and an ICA newsletter. And, since 1983 agricultural news programs were done on the local radio. All didactic materials were produced professionally to ensure easy access by peasant producers, women and school-age children.

By 1983, the ICA-DRI programme had reached about 4,250 peasant families in 12 municipalities in the Nariño Highlands, a significant increase over the coverage achieved previously. By 1987 this number had increased to around 8,000 covering 16 municipalities (ICA-DRI reports). This probably represents about 10-15% of the relevant smallholders in the region[2]. Given the conditions prevailing in the area and the resources available, a considerable institutional achievement. Moreover, since its initiation, the program seemed to have achieved a considerable coverage amongst the smallest of peasant producers. Within the municipality of Pasto, in 1979, 80 % of the DRI credit users held less than 10 hectares, whereas over 60% of them held less than 5 (Annual report ICA-CCH, 1979: 25).

On-farm research

In the late seventies, ICA/Extension began to place far greater emphasis on the adaptation of research recommendations to local conditions through on-farm trails. A Coordinator for on-farm adaptive research was assigned to the District Office to help extension staff design and manage trials and process the results. The trials concentrated on varieties and fertilization. In dairy, pastures and horticulture adaptive research was implemented and evaluated jointly by ICA/Research, ICA/Extension and subject-matter specialists from ICA-CCH. From 1978 onwards, extension staff maintained continuous on-farm trials in improved pastures, fodder crops and wheat at an average number of about 15 different locations; on-farm trials were also conducted for several horticultural crops. The potato extension programs used on-farm demonstrations widely. At the same time, the linear programming studies, farm budget and other economic evaluations of pilot farm operations carried out by the ICA-CCH provided valuable insights into alternative technical opportunities for peasant farmers. After the economics section of ICA-CCH was established in 1978, both research and extension incorporated a farm management perspective into the application of research recommendations. Adaptive research on commercial curí production was taken up by ICA/Extension and ICA-CCH in collaboration with the University of Nariño and the ICA Veterinary Centre in Pasto. In this research, a peasant cooperative - supported by INCORA - and individual peasant

[2] Due to the unreliability of the census data in this respect, this figure can only be taken as an educated guess to signal an order of magnitude. As such it has been checked with several independent sources who agreed it probably reflects the actual coverage by the programme at this stage.

farmers played a leading role as innovators; they kept detailed records of their operations and participated in the interpretation and analysis of the results.

Resource provision
The Nariño Highlands was one of the first regions in Colombia in which DRI became operational. DRI quickly became the sole source of finance for ICA/Extension's personnel and operational costs, and through Caja Agraria it financed most of the credit made available to peasant farmers. This gave DRI a considerable influence. It used its pivotal position to formulate a strategy for developing Nariño's peasant sector and to actively reinforce this strategy through the selective allocation of financial resources. Apart from its support for ICA/Extension's adaptive research programs, however, DRI did not finance research. This was consistent with the trend in Colombian agricultural policy at the time to place more emphasis on a 'go straight to the farmer' approach and concentrate less on research. National research expenditure dropped from 0.42% of the agricultural Gross Domestic Product in 1970 to 0.18% in 1978; since 1985, with the help of external finance, this figure has now approached the 1970 level again (Montes Llamas, 1987). Because of the lack of financial support from DRI, the regional research centre faced serious financial constraints during the late seventies and early eighties.

However, support from ICA-CCH enabled the centre to set up collaborative programs with ICA/Extension on potatoes, dairy, pastures, horticulture and fruticulture. Moreover, the ICA-CCH project provided for a number of key subject-matter specialists, both Colombian and Dutch, to be specifically assigned to developing extension packages in their fields of expertise. These subject-matter specialists played a vital role in the collaborative programs: they collected and adapted research recommendations, implemented on-farm research projects, assisted in the development of technical extension materials and trained extension staff. The resources provided by ICA-CCH also had a considerable impact upon PCTT operations. ICA-CCH communication specialists assisted in strengthening the methodology and introduced a number of complementary elements to it. These included: participatory diagnosis, which increased farmer participation in decision-making in extension (Engel, 1984, 1990b; Lopera et al., 1985); a method for the adaptation of technical to peasant vocabulary in written materials, making these more effective to peasants with little formal education; and a 5-minute radio news program, broadcast twice daily, which contained up-to-the-minute news on such items as meetings, demonstrations and research recommendations as well as interviews with farmers and farm women. These radio programmes proved very successful among peasant farmers (Guerrón and Verbaken, 1985).

4.4 Inter-institutional coordination

In this paragraph I will look at the degree of integration achieved between the core institutions and their programs introduced above. I will be particularly interested in the period of the early eighties when I signalled a take-off in production for three domains: dairy, curies and wheat. Can it be argued that during that period a more significant degree of institutional integration had been achieved amongst core institutions? And can it be shown that such integration was not achieved in the case of maize and beans which remained stagnant? And if so, can specific linkage mechanisms be pointed at which

facilitated such integration particularly in the three 'high impact domains'? In this paragraph I will try to answer these three questions and look into some of the external factors of influence as well.

During the 1975-1978 period, strong links existed between DRI, ICA/Extension and Caja Agraria, at the one hand, and ICA/Research and ICA-CCH, at the other. The first three institutions had offices in the town of Pasto, ICA/Extension even in the same building as Caja Agraria, whereas the latter two were located some miles away, at Obonuco. In 1978, however, ICA-CCH became a pilot program within ICA/Extension, was provided with additional subject-matter specialists, and moved into ICA/Extension offices in Pasto. Nonetheless, it maintained many of its ties with ICA/Research and continued to be involved in on-station research programs at the Obonuco experimental station. This proved a crucial move to elevate the level of integration between research and extension. Whereas links were very weak during the early and mid 1970ies, in fact they were limited to irregular informal contacts, as from 1978 links were systematically developed and strengthened. Within the domains relevant to ICA-CCH a high level of coordination of tasks was achieved. After a period of adjustment, ICA/Extension and ICA-CCH subject-matter staff played the role of 'integrators' within the system, facilitating coordination between all core institutions, including research. One example of such integrated efforts was the 'Unidad Minifundio', a mixed farm unit (1 ha) collectively designed and operated at the experimental station by an interdisciplinary group of ICA/Extension, ICA-CCH and ICA/Research specialists.

Institutional integration also had a considerable effect on the DRI credit program. Before 1978, ICA/Extension had started to promote DRI credit to peasant farmers but its impact was limited. The main reason being that its technical support, as well as its credit was focused on individuals rather than groups without any back-up of group or mass communication media; in addition, priorities were not clearly defined and, with the possible exception of the potato program, technical messages were poorly articulated. As from 1978 and particularly during the early eighties, when the PCTT methodology had been introduced, assistance from the ICA-CCH subject-matter specialists in setting economical and technical priorities, in formulating extension contents and developing extension materials became permanent elements in ICA/Extension's activities. Mass media back-up - printed, audiovisual and radio - was provided. Technical issues were often discussed at regional and national ICA-CCH committee meetings. And since 1982, DRI, along with ICA/Extension and ICA/Research representatives, formally took part in the ICA-CCH national coordination meetings.

> ***Paulino's choice:*** The story of Paulino Jojoa, a peasant farmer in the Nariño Highlands in the Southernmost part of Colombia, illustrates the mutual adjustment achieved between a number of core institutions in order to create an un-precedented solution:
> Around 1980, Paulino and his family own a 1.4 hectare farm in a village close to Pasto, the regional capital. He had long had the idea of investing in improved curí raising, but so far the bank had not been keen on helping him. After the ICA-CCH farm economists, on the basis of the evidence collected from elsewhere and from adaptive trials performed at the Obonuco experimental station, had been able to

convince the Caja Agraria of the profitability of curí breeding when using improved technology for housing, feeding and breeding, the bank was now willing to lend him the money for building a permanent guinea pig shed.
However, Paulino's risk was considerable: he was the first peasant farmer to acquire such a loan; if, unexpectedly, the guinea pig adventure would not provide the expected benefits and the loan would go sour, he would loose his small holding to the bank. Who would give a dime for an empty guinea pig shed? His solution was proverbial: Instead of building a shed, he asked for a higher loan to built a house. As he was backed by ICA/Extension and ICA-CCH, Caja Agraria agreed. And a house he built: at least, the walls, the roof, the windows and the design - including the outdoor painting - were those of a fancy rural home. Then, instead of transferring his family to it, as everyone expected, they staid were they were, in their own, old mud block house next to the new building. Meanwhile, he arranged the inside of the new "shed" to hold a large number of guinea pigs following the exact technical specifications of the specialists.
Up till 1987, when I saw him last, he continued to produce guinea pigs of a high quality, providing him and his family with a good and stable income. He and his son had also acquired leadership roles in the village because of it. But if the loan had gone sour, he would have been able to sell the "shed" as a fancy rural house to rich urbanites, thus avoiding the loss of his own house and farm.....!

When I look at the way in which coordination was achieved during the early eighties in more detail, two issues seem of particular relevance. In the first place, institutional leadership and a considerable degree of strategic consensus was achieved. In the second place, coordination of development and transfer tasks amongst institutions was achieved quite effectively. In the following I will look at the different linkage mechanisms which underpinned these achievements.

Institutional leadership and strategic consensus
Technical leadership was and had been for a long time in the hands of ICA, the institution with the necessary knowledge and experience in the region to successfully develop and introduce improved technologies to peasant producers. As from the mid 1970ies, political leadership was in the hands of DRI, leading agency for the implementation of the Integrated Rural Development Programme. ICA/Research had been present in Nariño since 1946, and had research programs on most of the important crops and animal husbandry activities relevant to small farmers. The expertise within the ICA-CCH team complemented the technical capacity of ICA/Research in dairy, horticulture and fruticulture, and was instrumental in developing awareness about the technical possibilities of curí production. At the same time, ICA/Extension had long experience in the field with the highland peasants. Its most significant contribution was undoubtedly the introduction of the PCTT methodology - a flexible extension management system 'avant-la-lettre' - which provided the tools to systematically plan and implement multi-media extension campaigns, directed at groups of peasant farmers at the village level. ICA-CCH added subject-matter specialists, economists and communication specialists to their team.

After a slow start, DRI asserted its political leadership in Nariño in 1978; by then, DRI was financing all peasant-oriented operations of ICA/Extension and Caja Agraria. In order to approve the national counterpart budget to the ICA-CCH operations, it insisted

the project moved to the ICA/Extension Office and integrated itself as a pilot project into DRI operations. Through participating actively in the national coordinating committee, and ICA-CCH joint evaluation missions, DRI achieved considerable influence on the course of the bilateral technical assistance project. Yet, at the same time it permitted the project to play an innovative role: although DRI policy was *not* to finance subject-matter specialists, it did so in Nariño in order to help fulfil bilateral counterpart requirements; and although DRI policy did not finance research, it did finance on-farm research in Nariño. DRI leadership was further strengthened in 1983 when District Planning Seminars organized by DRI had formulated the priorities that were to guide the disbursement of loans to peasant farmers.

Table 8: Program priorities amongst core institutions in the Nariño Highlands, 1982 to 1986

	1982			*1984*				*1986*		
Program	*E*	*R*	*C*	*E*	*R*	*C*	*D*	*E*	*R*	*D*
Dairy	*	*	*	*	*	*	*	*	*	*
Curies	*		*	*		*		*		
Past./fodd.	*	*	*	*	*	*	*	*	*	*
Wheat/bar.	*	*		*	*		*	*	*	*
Potatoes	*	*		*	*		*	*	*	*
Maize	*	*		*	*		*	*	*	*
Beans	*	*		*	*		*	*	*	*
Intercrop		*			*				*	
Vegetables	*	*	*	*	*				*	
Fruits	*		*	*	*	*		*	*	
Agric.econ.	*		*	*		*			*	
Communic.	*		*	*		*		*		
Soils		*			*				*	
Agr.mach.		*			*				*	
Entomol.		*			*				*	
Phytopath.		*			*				*	
Vet.service	*		*	*		*		*		

Note: E=ICA/Extension; R=ICA/Research; C=ICA-CCH; D=DRI.
Source: ICA, ICA-CCH & DRI Annual Reports.

These priorities were carefully chosen to reflect both the needs of the peasant producers and the on-going programs of ICA, in order to make the best use of the technical expertise already available in the region. The eventual result was a considerable strategic consensus among core institutions. During the 1978-1985 period they shared a common goal - to improve the well-being of the peasants through the introduction of improved agricultural technologies - and directed their activities to a specific, well-defined client group, as stipulated by the DRI programme. Table 4.3 shows the extent to which such a strategic consensus on priorities was reached during the period. It shows each of the institutions to maintain certain programs of their own in accordance with their individual mandate, whereas program priorities towards the peasant sector coincide mostly.

A number of specific linkages mechanisms contributed to the development and reinforcement of leadership and strategic consensus:

(1) To carry out its tasks of planning, budgeting, financing and monitoring activities in the region, the DRI regional office established strong links with the national DRI office and with a number of organizations operating in Nariño. Regular meetings of this *DRI Departmental Committee* were attended by policy makers and representatives from extension, training, marketing, input distribution and, to some degree, farmers and discussed credit targeting policies, staff and other resource allocations. (2) The *DRI Technical Committee* responsible for Nariño met monthly and involved the directors of all

relevant agricultural institutions. These meetings were intended to boost coordination rather than control; they reinforced institutional targeting and strengthened the links, mostly informal, between technical institutions. Decisions concerning the allocation of resources were taken at higher levels.
(3) The quarterly *ICA-CCH national and regional coordinating committee meetings*, reinforced by bi-annual joint evaluation missions, strengthened international, national and regional coordination. They focused on agricultural development in Nariño, government policy and technical opportunities for peasant farmers and, in response to identified constraints and technical opportunities, re-allocated ICA-CCH project funds.

The DRI Departmental Committee generally assigned priorities on the basis of national policy and the current contribution of the planted area to regional and/or national agricultural output. The ICA-CCH coordinating committees placed more emphasis on identifying and exploring future high-potential domains for peasant production, hence the priority attached to horticulture, curies and fruticulture. As both committees commanded considerable resources for the tasks assigned to them, this resulted in a situation which, in terms of targeting resources, DRI and ICA-CCH efforts complemented each other to a large degree (see table 8). While from the table a general coincidence between integration of efforts and joint targeting is apparent, as yet it is not clear whether this had anything to do with the impact achieved in dairy, curies and wheat, as against maize and beans. DRI's leadership in targeting dairy and wheat did most probably contribute greatly to the success of the institutional interventions in these domains. The limited scale of the success in curies, at the other hand, warrants the notion that it was ICA-CCH's technical and financial leadership which pulled that off. Yet, why did DRI not achieve the same success in maize and beans? In order to address this question I have to dive deeper into the linkage mechanisms which lay at the roots of institutional performance at the farm level.

Performance of technology development and transfer tasks
A number of formal linkage mechanisms were established within the innovation theatre of peasant agriculture in Nariño. The most frequently used ones are briefly discussed here:
(1) *Collaborative task groups* of technicians were regularly established at the district level to jointly perform specific activities, such as to compile a multi-disciplinary survey reports, a multi-media extension campaign, the design and implementation of an on-farm or on-station experimental program or the production of a training manual or extension brochure. Some of these groups were temporary, meeting intensively over a period of some months, others were rather permanent, meeting each month over a period of four years, as was the case of the group which managed the intensive mixed farming unit at the regional research centre.
(2) *Subject-matter specialists* (technical, economic and communication) assumed responsibility for coordinating adaptive research, staff training, extension programs and the production of extension materials. They needed to have both technical and communication skills, and maintained close links with farmers, extension workers and researchers. As shown in table 9, the sharp increase in the number and coverage of subject-matter specialists in 1978-1980 coincided with the ICA-CCH move to ICA/Extension and with the subsequent shift of emphasis towards impact and dissemination.
(3) Systematic programs of *on-farm trials* and experiments were performed by research or extension staff in collaboration with farmers to adapt technologies to the specific

conditions of a community or a zone. Generally, these trials involved formal agreements between the farmer and the implementing institution, including subsidized inputs and, in the case of high risk operations, compensation.

The relation between the use of certain task-related linkage mechanisms within specific domains of agricultural production in Nariño in 1981 and the institutional impact in these domains is shown in table 10. The table suggests that the use of collaborative task groups, subject-matter specialists and on-farm trials can be clearly associated with high levels of impact in this case. Training, measured by the existence of training manuals in 1981, can not be said to have a clear contribution to domain impact. Apparently, whereas impact can not be achieved without training field workers, training alone is not enough where other linkages fail.

Table 9: Number of subject-matter specialists assigned to the Nariño Highlands, 1974 to 1984

Specialization	*74-76*	*76-78*	*78-80*	*80-82*	*82-84*
Dairy production	4	4	3	2	2
Pastures & fodder	1	1	1	1	1
Curies	-	-	-	1	2
Milk processing	2	1	1	1	1
Horti/fruticulture	-	-	3	3	3
Socio-economics	-	-	2	2	2
Ext./communication	-	-	-	2	3
Total	*5*	*6*	*11*	*13*	*14*

Source: ICA-CCH Final Report, 1985.

External factors

A number of external factors had a positive effect on system integration and performance as well. In the first place, agricultural policy towards the peasant sector was relatively stable during the 1975-1985 period, providing the institutions with time to organize their relationships. The experience in Nariño suggests that even if adequate formal and informal linkage mechanisms are in place, as was the case in 1978, impact will be noticeable only after a considerable time lag. Apparently, the institutions need time to work out their roles and reach a degree of consensus on priorities, whereas concrete results at the farm level are not reached overnight either. Our data suggests that this 'warming-up' period of mutual adjustment took about two years.

In the second place, throughout the 1978-1985 period financial and human resources were available and adequate. DRI financed field staff, operations and credit; ICA-CCH provided finances for additional specialist support, training, contingency funds and some operational costs. In addition, ICA-CCH funds proved particularly helpful in exploratory research, such as in curies, and in overcoming temporary budgetary constraints which hinder the smooth operation of already agreed upon field programs. Thirdly, adequate marketing opportunities were available in most domains, particularly in the case of dairy. Rising farm gate prices and the establishment of new milk collection and processing industries made dairy farming attractive for many peasant farmers in Nariño.

An external factor which had a negative effect on the performance of all the core institutions was centralized decision-making. ICA/Research programs in Nariño, for

Table 10: Domain impact in relation to the operation of specific task-related linkage mechanisms within the domain, 1981.

	High impact domains			*Low impact domains*	
Linkage mechanism	*Dairy*[1]	*Curies*	*Wheat*	*Maize*	*Beans*
Collaborative task groups	yes	yes	yes	no	no
Subject-matter specialists	yes	yes	yes	no	no
On-farm trials	yes	yes	yes	no	yes[2]
Training manuals	yes	yes	yes	yes	yes

Notes: [1] 'dairy' includes pasture management; the two cases are identical.
[2] demonstrations were held but on-farm evaluations were not as widespread and systematic as in the case of wheat.
Source: ICA-CCH Reports, ICA-DRI report, this research.

example, tended to follow national priorities. Thus, although FAO had recommended as early as 1952 that the regional research station should initiate research on curí production (Muñoz, 1970), this recommendation was not taken up. These protein-rich animals are eaten only in certain parts of Colombia and were therefore not regarded as a national priority. The decision to undertake adaptive research in curí husbandry was eventually taken at the district level by ICA-CCH, without the involvement of ICA/Research, and was later approved by the regional and national ICA-CCH committees. Another example concerns the PCTT extension methodology. Although it was an effective extension planning and management instrument, it did not incorporate the use of farmer participation in setting extension priorities. Having identified this as a constraint, ICA-CCH with ICA/Extension set out to fill this gap by introducing the participatory diagnosis method as an element of the methodology (Engel, 1984). However, although it proved efficient in the field, was tested by ICA field staff in another peasant region and was adopted nationwide by the ICA-UNICEF project and used by CORFAS in Nariño, it did not become a formal part of the national PCTT design.

A final example of the irrationalities stemming from centralized decision-making concerns ICA's publications policy. During the period under study, ICA encouraged research and extension staff to write technical publications by offering salary increments for any materials published officially. However, for extension publications to be accepted for official publication, it was to be approved by the Publications Council at the national headquarters; the approval process involved decisions by people from eight different ICA units and a minimum of 47 actions. Inevitably, many titles are either published too late for extension purposes or remain unofficial. In 1981, for Nariño only one title was published officially. Over the following few years, publication procedures for this region were relaxed somewhat; local printing and audiovisual facilities were established under a Dutch grant, and provisional editions of all extension publications emanating from the Nariño districts were allowed to be printed locally before being submitted for official screening and approval. This resulted in a sharp increase in the regional production and use of didactic materials; in 1984 alone, 11 titles were published.

4.5 Sustainability of institutional performance

A more general conclusion surging from the above is that to a certain degree institutional performance can be 'managed', i.e. that certain things can be done to enhance it, whereas others work against it. In this paragraph I want to explore this line of reflection a little further by looking at the sustainability of institutional performance in innovating peasant agriculture. In order to do this I will take a close look at the situation from 1985 to 1987. What are the prospects for the core institutions to sustain their impact? I will centre our argument around three types of events which took place: policy shifts, a decline in system integration, and the emergence of organized user control.

Policy shifts

Agricultural policies in Colombia have shifted rapidly since 1985, from focusing on the highland peasant-farming areas to developing the country's lowland agricultural frontier areas. As a result, the DRI budget has been cut considerably and the DRI has concentrated its efforts in Nariño on marketing and infrastructural projects. DRI funding for agricultural technology programs has been reduced to the minimum and, although credits are still provided, there is little finance available for extension services. ICA/Extension policy has also changed. Some efforts have been redirected into setting up a new information system for rural areas through the establishment of District Information Centres. One such centre was to be established in Pasto. However, the initiative has suffered from lack of funds and, in 1987, had added little to the already existing human resources, infrastructure and practices in Nariño. In 1987, ICA announced yet another extension policy, termed 'integrated model for regional development' and implemented through Regional Training and Technology Diffusion Centres (CRECEDs). The CRECEDs are designed to integrate research and extension services within each agro-ecological zone and, through Advisory Boards, plant the type and extent of producer participation in technology generation and diffusion (ICA, 1987). In 1987, it was unclear whether this initiative would be backed with the resources required for successful implementation. In the meantime, financial resources for extension have become extremely limited.

The ICA-CCH bilateral project was terminated in June 1985. As a result, ICA/Extension lost most of its subject-matter specialists; some were rescued by ICA transferring them to ICA/Research's regional station at Obonuco. This was possible because in 1983, ICA succeeded in obtaining external funding for research. This went some way towards reducing the financial constraints faced by the Obonuco research station; it was formally designated the national research station for peasant agriculture, and also became the headquarters of the national cereals research program. By 1988, however, the financial situation deteriorated considerably; the station was faced with budget cuts of up to 60% for some programs, and operational expenses were stripped to the bare minimum. Operational expenses for on-farm research could only be met now if external funds, either from the private sector or foreign donors, were available.

Decline of system integration

The decline in DRI's resources has been accompanied by a decline in the institutional leadership provided by DRI, particularly with regard to technology development. By 1987, in addition to their normal programming and administrative tasks, extension area

managers are also expected to assume subject-matter specialists' tasks. They have continued to organize adaptive trials, but have been able to devote very little time to adapting new technologies or developing new extension materials. Illustrative is extension programming: since 1985, very little time is available to design new PCTT plans, or even improve existing ones. Most PCTT plans in operation in 1987 had been designed in 1983. In the 1984-1987 period, emphasis was placed on increasing coverage by repetition, and the number of farmers reached doubled; in the meantime, however, the development of new subject-matter content stagnated. The production of written extension materials also decreased, from 15 titles in 1983 to 5 in 1987, of which two were reprints and two were one-page leaflets. Besides, the reduction in the number of subject-matter specialists had a serious effect on research-extension integration in that it led to the demise of collaborative task groups. As a result, inter-institutional coordination declined considerably between 1985 and 1987, with collaboration between research and extension reverting to predominantly informal relationships.

Organized user control

While the configuration of institutions which since the early eighties successfully forged an impact in peasant agriculture came under extreme pressure, other organization entered the agricultural scene in full force. Cooperatives, non-government and user organizations may be able to address some of the problems outlined in the previous paragraphs. The establishment of such organizations is a comparatively recent development and, in 1987, it remains unclear as to what degree they can actually influence technology development and transfer in Nariño and who their main beneficiaries amongst producers will be. The milk cooperative, COOPROLACTEOS, and the cereal growers' association, FENALCE, are both strong and articulate enough to take on a leadership role and to demand services from the relevant institutions. The regional beer brewery, Bavaria, has recently started to finance ICA's adaptive research on barley.

COOPROLACTEOS has already played a leading role in some areas. It is likely to strengthen its involvement in technology development for dairy producers. Established in 1977 with Dutch assistance, it has grown into a multi-million pesos organization producing a wide range of dairy products for Nariño and other regions. Its membership consists mainly of small and medium producers, whose interests it represents at both the regional and national levels. FENALCE might play a more influential role in setting technology development and transfer priorities for small producers, but is less firmly rooted in Nariño than COOPROLACTEOS. DRI, at the other hand, has established a National Association for DRI users, ANDRI, with a regional chapter in Nariño. However, it is unlikely ANDRI will have much influence on institutional policies. The curí producers association, ASOCUY, has not yet established itself as a strong regional organization.

In 1986, ICA/Research established an Advisory Council for its regional research centre at Obonuco. The council meetings are attended by commercial farmers, agricultural professionals and a peasant farmers' representative. Prior to this, there was no mechanism whereby peasant farmers could exert a direct influence on the centre's research policy. However, the effective participation of the peasant farmers' representative does encounter strong limitations of a socio-cultural nature.

4.6 Some tentative conclusions

Against the background of the review of agricultural performance among the peasant sector in Nariño, tentatively a number of conclusions can be drawn. In the first place it seems the period during which system integration was at its highest coincides remarkably well with a period of increased impact in agricultural performance. To hypothesize a direct link between improved inter-institutional coordination and impact with respect to agricultural innovation, seems not too farfetched. Secondly, during this same period strong institutional leadership and strategic consensus developed among core institutions. This was closely related to the effective allocation of financial resources in line with well-defined institutional policies and priorities. Therefore,it seems likely that leadership, strategic consensus and resource linkages play an important role in forging inter-institutional coordination. Thirdly, a number of task-related linkage mechanisms have been identified which can be associated directly with high institutional performance and impact. However effective general policies and leadership, apparently a number of concrete linkage mechanisms have to be operative as well. In this case, this applied to collaborative task groups, subject-matter specialists and on-farm adaptive trials.

The common characteristic between these linkage mechanisms seems to be the creation of learning opportunities. Some, such as collaborative task groups, provide interdisciplinary and/or inter-institutional learning settings to professional staff which is otherwise engaged in developing his or her own specialization. Others, like on-farm trials, help create opportunities to learn from, and with farmers. In the case of the subject-matter specialists, it puts professionals in a liaison position through which they are enabled to collect and integrate knowledge and information from different relevant sources into practically tested packages of technical recommendations. This leads us to suggest that the existence of (joint) learning opportunities as well as the integration of knowledge and information from different relevant sources, must be considered important elements in explaining the effectiveness of interventions in agricultural innovation theatres.

As far as contextual factors are concerned, it seems clear that stable agricultural policies, adequate financial and human resources, and incentives for agricultural development at the farm level are necessary conditions for effective performance of agricultural institutions. This of course, is not new. It underlines the importance of the particular conditions we found in the Nariño theatre for the purpose of this study. Additionally, a degree of decentralization in decision-making is probably also associated with high performance; centralized decision-making may effectively block institutional performance and integration at the district and field level

I conclude from the case study that although integration seems an important factor to explain institutional impact with respect to small-holder innovation in agriculture, it is not enough. Strategic consensus, institutional leadership and adequate allocation of funds play an important role as well. In addition, what sets effective linkage mechanisms apart it seems, is their contribution to the creation of joint learning opportunities between the relevant social and institutional actors. Therefore, the case study suggests that innovative impact on smallholder agriculture requires relevant social actors to not only liaise effectively but to ally themselves and to develop a shared competence for innovating agricultural practices. We will follow up on this point in the next chapter.

5. *The emergence of innovation configurations*[1]

"In the end, links are between people" (G. Montes Llamas[2])

5.1 Introduction

In the last chapter I argued a positive relationship between inter-institutional coordination and impact. It appeared that institutional leadership, strategic consensus and resource linkages play an important role in accomplishing coordination. In this chapter I intend to explore this issue further: How do institutions actually achieve coordination? How do they nudge each other into mutual adjustments? And what role does institutional leadership play? My argument is that specific patterns of interactive relationships emerge in complex innovation theatres, characteristically involving a limited set of core actors which by virtue of the (human, financial, and other) resources they command is able to wield considerable influence upon other actors and hence, to effectively direct the course of innovation. I will illustrate the process by which such patterns evolve with the help of the Nariño case study materials (5.2). I will label such patterns *institutional configurations*. Besides, with the help of other case study materials as well, I will underscore the pivotal role such configurations play in determining the course of agricultural innovation, and highlight some of their basic characteristics. I propose an institutional configuration as the result of accommodations in views, procedures and resource allocations among core actors, is the closest we have to a joint management structure for coordinating tasks in complex innovation theatres (5.3). Next, I argue that different kinds of institutional leadership may be associated with different ways of coordinating tasks among institutions and, as a result, with particular strengths and weaknesses with respect to innovative performance (5.4). This leads to a central hypothesis to guide the analysis of leadership in complex innovation theatres: effective leadership leads to the emergence of particular institutional configurations, bound together through meshes of specific coordinating mechanisms and demonstrating characteristic strength and weaknesses as far as innovative performance is concerned.

I then propose the concept of *basic configurations* as an instrument to analyze institutional configurations in practice and to help understand the behaviour of the whole (5.5). Also, I specify the contributions I expect such an approach to make to our understanding of leadership and coordination in complex innovation theatres. Finally, I make a comparison between the perspective I propose and Mintzberg's conceptualization of organisational configurations. The principles underlying both approaches being very similar, I suggest

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[1] This chapter is a revised and extended version of Engel, 1993c. It is based on research done with Stephan Seegers (Engel & Seegers, 1992).

[2] Director General, ICA, Colombia (cited in: Merrill-Sands & Kaimowitz, 1989:69)

some modifications to Mintzberg's approach which could accommodate it to the study of less rationally designed and more socially organized collective behaviour so that it could be further explored as a means of supporting the interpretation of ideas and events as we know them in complex agricultural innovation theatres and how using these concepts leads to meaningful discourse and further research on leadership and coordination in relation to competent performance in innovation. Finally I present the preliminary conclusions on the social organization of agricultural innovation I draw from the materials reviewed in this chapter (5.6).

This chapter continues to build on the case study materials discussed in chapter four but rests mainly on the results of a study we did with Stephan Seegers to review the findings of 20 cases studies done by national research teams in 7 developing countries as part of the ISNAR Research/Technology Transfer Linkages Study (Engel & Seegers, 1992)[3]. Links between agricultural institutions, (non)governmental development organizations, rural and agro-based industries and marketing bodies have received a great deal of attention during the last decade. Our line of argument, however, differs from the one proposed most frequently. Mostly, students have searched for the effectiveness of individual links, implying that many of the links existing in agricultural development today are ineffective and that some types of links are generally more effective than others. We felt this approach had to be complemented. Links between institutional actors can not be isolated from the social relationship patterns they are part of. The effectiveness or ineffectiveness of particular links, to a great extent stems from their being a part of such patterns. Moreover, their effectiveness is tied to whether social actors *make them work* as part of their strategies. Therefore, no links are either effective or ineffective on their own. Rather, the case studies reveal that certain regularities in relationship patterns can be recognized, each of which can be associated with specific strengths and weaknesses in the performance of the whole. We felt such patterns rather than individual links need to be the object of our analysis.

5.2 Creating a successful institutional alliance: Nariño[4]

In the last chapter I have shown the difference in institutional impact before and after 1978, when the Dutch bilateral development project (ICA-CCH) was integrated with the Integrated Rural Development Programme (DRI). As it appeared, the combination of institutions resulting from that move achieved both coordination and impact successfully. How this alliance was created, why, and how it operated is what I intend to explore further in this paragraph.

One of the main objectives of DRI in Nariño was to increase small farmer family income through the introduction of improved technology at the farm level. It was complementary to its other programmes, such as rural housing. Yet, DRI designers knew the

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[3] International Service for National Agricultural Research, The Hague: RTTL Study (see Eponou, 1993 for a complete list of documents).

[4] This paragraph is drawn from Engel, 1989b: *Peasant Technology Development...*

improvement of on-farm agricultural practices was not something DRI could do all by itself. It depended heavily on the cooperation of ICA, one of the few institutions which combined long-standing experience in the field working with peasant farmers with the technical expertise needed to actually suggest on-farm improvements. Also it needed the agricultural bank, Caja Agraria (CA), and its institutional presence in most of the municipalities, to provide for credit handling facilities. As a result, DRI's intention to innovate agricultural practices among small farmers created a functional interdependence among these institutions. That is, in the eyes of DRI designers. However, the Colombian Government was foresighted and created not only the wish to collaborate on the part of DRI, but also gave DRI the means to reinforce it and to build a coalition of institutions to do the job. DRI was made the financing agency for ICA/Extension, and provided the money for a new line of credit which in one single blow made the CA the most important source of credit for peasant farmers in Nariño. This target category, by far the largest segment of Nariño's rural population, CA had never been able to attend effectively before.

The lack of integration with ICA/Research during DRI's first years of existence is characteristic of the importance such resource linkages have in forging institutional alliances. While during the early DRI period until 1978, coordination of tasks between CA and ICA/E was well organized, no significant collaboration with ICA/R existed. This was consistent with DRI policy: it insisted on using those technologies 'available on the shelf' rather than spending time and money doing more research.

As we have shown (chapter four), the integration with the Dutch project 'ICA Convenio Colombo-Holandés' (ICA-CCH) changed all this. The ICA-CCH originally worked closely with ICA/Research. In 1978, however, under pressure of DRI it was transferred to be integrated with ICA/Extension. DRI still did not want to finance research, but in the negotiations which preceded the redesign of the development cooperation project had to cede one step and had to accept financing adaptive research and subject-matter specialists who would play a role as counterparts to the Dutch experts and as liaisons between research and extension. In return, DRI reinforced its institutional coalition with specialists in dairy production, veterinary services, horti/fruticulture and socio-economics paid for by the Dutch (see table 9). Later on, other specialists were added the same way. Typically, such negotiations did not take place only once. Every two years when the bilateral cooperation project was evaluated, the same issue (a fundamental difference in policy between DRI and ICA-CCH) had to be reviewed and renegotiated.

Negotiating institutional accommodations

In fact, adjustments took place almost continuously at the different levels between the institutions. It shows, for example, in the changes of composition of both coordinating bodies which controlled ICA-CCH project, the National Coordinating Committee (NCC) and the Regional Executive Committee (REC). Just to name one example: since 1978 DRI representatives participated directly in the NCC. An ICA/R representative who had been on the committee earlier on was taken off the committee at the same moment DRI representative came on. However, the ICA/Representative was reinstalled again in 1982 when the balance had shifted again somewhat in favour of ICA. Readjustments in the role of the Dutch ICA-CCH project, since 1974 an important actor in the Nariño theatre, also show in its name and general objectives. While in the period from 1974 to 1978 its name

was *'improving the life standards of the peasants in Nariño, with emphasis on the production and processing of milk'*, after 1978 under the influence of DRI it became more integrated: *'agricultural development of small-holder producers'*. While the main thrust of the project remained focused on developing improved agricultural practices at the farm level, concrete results of this change in emphasis were: a scope beyond dairy and milk, a wider range of subject-matter specialists including emphasis on socio-economics and communication. In fact, every two years minor adjustments were implemented on the basis of periodic evaluations, jointly performed by ICA and Dutch experts and since 1978, DRI representatives.

These examples show that inter-institutional relationships are the result of negotiations over objectives, tasks and resource allocations between different institutions, and are never static. Their content and shape is continuously readjusted in practice. Some of these readjustments are planned in advance and sealed in formal agreements, others may be ad-hoc and remain largely informal. The origin of these accommodations is the wish and/or the need perceived by a number of social actors to cooperate. In the case of Nariño, DRI had an obvious need to link up with ICA and CA. DRI had no presence at the farmer level in the region at all. Besides, small-holder agriculture was technically an unknown territory to DRI. Government institutions which did work with small-holders in Nariño included INCORA involved in land reform and CECORA supporting the formation peasant cooperatives. However, political support for these institutions had diminished dramatically during the early seventies and besides, DRI was intended to intervene in agricultural production, not in the organization of farmers. DRI's main purpose was the modernization of peasant agriculture. Therefore, it focused its attention on collaboration with ICA, an institution with a long-standing institutional presence, a number of years of experience in working with small-holders in extension, and a solid experience in agricultural research in the Highlands, and on the CA, which as a bank had offices in most municipal capitals and had gained considerable experience with extending credit to private farmers in Nariño, though not the smallest ones. ICA was very interested in DRI to take over financial support of its extension activities. In 1975 the Regional Rural Development Project which had financed ICA Extension was terminated. Collaboration with DRI meant for ICA an opportunity to continue and even significantly increase its operations in Nariño. The same for CA, an institution which as yet had not been able to develop a line of credit which served really small farmers effectively.

Initially, the role of on-farm adaptation, socio-economic constraints, local agro-industries and social differentiation within the peasant population had been given very little attention by DRI and the mostly technical specialists of ICA. The evaluation of the ICA-CCH in 1978 and the changes it precipitated changed all this. It was concluded that, in order to achieve more wide-spread impact of improved technologies developed at the ICA Obonuco research station, collaboration with ICA/Extension had to be sought. As ICA/E was 100% DRI financed, this meant collaborating with DRI. In the negotiations that followed, DRI agreed to finance ICA-CCH counterpart staff and their operational costs. This meant a significant strengthening of ICA/Extension, particularly with subject-matter specialists and adaptive on-farm research in dairy, pastures, horti/fruticulture, socio-economics and communication. This was a significant result of the negotiations, as until then DRI had not been willing to finance such specialists nor their activities. As I have argued in chapter 4, the active participation of the ICA-CCH project was so relevant to

the other actors because it provided a link with ICA Research, it brought in external technical expertise, and it spend a considerable part of its resources to the on-farm adaptation of improved agricultural practices. And it insisted on evaluating socio-economic and communication parameters affecting adaptation and adoption of improved technologies by small-holders. ICA Extension, because of the restrictions imposed by DRI, did not have the means to do so. ICA Research, left out for the same reason, was left without funds and unable to respond adequately. Other actors were either to weak or too insignificant. Most probably, some of the managers responsible for the DRI programme also recognized this 'flaw' in the original design of their programme.

The above illustrates how, in order to achieve their individual objectives - including survival as an institution! - institutions may have to rally behind one banner and coordinate their efforts. This can only be done when mutual interdependence is recognized by all relevant stakeholders. Interdependence may be financial, technical, political or otherwise. The eventual result is a process of negotiation in which shared objectives are defined, tasks and responsibilities are assigned and resources are allocated. The banner DRI, CA, ICA and ICA-CCH eventually adopted as theirs in 1978 was formulated roughly as follows: *to improve the income of small-holder families in the Nariño Highlands through the introduction of improved technology at the farm level.* We may call this their joint *mission*: a statement which sums up intentions, strategy and intended beneficiaries. It reflects an agreed upon 'theory of intervention' among the institutional actors involved. In this case, it projects the view that the use of improved agricultural technology will make farm family incomes rise. This 'modernist' perception was grounded mostly in on-station experimental results showing productivity increases as a result of improved farming practices.

Multiple leadership

In the Nariño innovation theatre of small-holder agriculture, clearly, several actors were able to command authority over the innovation process at the small farm level: DRI, through its selective allocation of budgets to finance just those institutional programs which it perceived as necessary to achieve its ends; ICA, making use of its region-wide presence and technical expertise on small-holder agriculture; ICA-CCH, by means of negotiating its technical and financial contribution. In a more subtle way, CA was also one of them: it stuck to its national credit regulations for lending to small-holder families, for example by demanding land or equipment as collateral. This led Paulino to design his proverbial solution for the guinea pig stable (chapter four). Its lending policy, therefore, had a distinct influence on the spread of technological innovations, particularly as the ones offered by ICA relied heavily on capital input for their application. The pattern of social relationships emerging from the respective efforts of these institutions to actually influence the decisions of others, is therefore is a multiple one. It reflects the objectives, strategies and resources of the different actors taking part. Its impact has to be understood as the result of their combined effort (see below).

> ***Peasant technology development in Nariño:***
> In order to explain a relatively effective technological innovation process covering 10-15% of the peasant farmers in the Highlands, one has to consider not only ICA's technical leadership, emphasizing the elaboration of technical packages and working procedures, but also the role of DRI, strong in supervising programme

implementation, articulating development priorities and steering resource allocations. At the same time, the Dutch bilateral cooperation project added attention to knowledge and skills development and consolidation, and facilitated mutual adjustment between relevant parties. After having been established firmly as a regional milk processing cooperative, Cooprolacteos added market orientation (Source: Engel, 1990a).

On the other hand, if we compare the degree of influence on technological developments in small-holder agriculture during the 1978-1985 period of some, notably DRI, ICA, ICA-CCH and, to a lesser extent, CA, with that of other actors, such as ICA Research, University of Nariño, SENA, ICA-UNICEF, we must conclude that the former may rightfully be referred to as *core actors*. They represented the main driving forces behind innovation of small-holder practices in Nariño during that period. After 1985, when the ICA-CCH was terminated and DRI withdrew its support for adaptive research first, then gradually over a number of years for ICA/Extension as a whole. Firstly, this was due to a shift in financing policies, away from the relatively quiet rural areas of Nariño to more conflictive areas, but eventually, also due to a slow but steady decentralization policy initiated by the central government, transferring control over agricultural extension gradually from ICA to municipal authorities. As a consequence, the combined influence of the national institutions which had spearheaded agricultural development among small-holders declined, whilst other actors strengthened their grip, amongst them private companies, such as the local beer factory, a non-governmental agency, CORFAS, and a farmer cooperative, COOPROLACTEOS. Characteristically, the latter two had been established with significant support by the Dutch Government, DRI and also UNICEF.

Coordinating mechanisms

The Nariño case also serves to illustrate the mechanisms by which core institutions effectuate their leadership. We have mentioned how DRI implemented budget allocations and control to force ICA Extension to spend DRI resources on specific items, only those consistent with the DRI programme. DRI effectively controlled the types of agricultural specialists ICA could allocate to the programme, the money it could spend on specific budget items, such as personnel, travel expenses, transport, didactic materials, equipment, etc. DRI also set out the framework for extension activities: it specified which farmers were 'small-holder farmers' and could be supported, it defined farmer-staff ratios, and decided which areas and which crops and animal husbandry activities could be attended. Finally, DRI's instructions on monitoring, reporting and evaluation were very precise.

On the other hand, ICA/Extension struggled to impose its own approach to group extension, the *Communication Plans for Technology Transfer*, and designed its technical recommendations, staff qualifications, extension materials and visiting schedules according to its own standards. Also, its staff together with staff of other core institutions participated in setting regional DRI priorities. Its close association with the ICA-CCH project made it possible for ICA to readjust its recommendations to small-holder circumstances and to significantly improve its analysis of small farm economics and the quality of its extension and training materials. It even became possible to assign a small number of specialists to themes which were *not* DRI priorities, but nevertheless, in the eyes of ICA and ICA-CCH were promising enough as possible future alternatives for small-holder agriculture, such as guinea pigs and fruit trees. The ICA-CCH project played

an important role initiating and legitimizing such 'new' technical alternatives, defining technically and economically feasible recommendation packages to farmers, and providing in-service training to ICA field staff. Moreover, as we have seen in chapter 4, the project was instrumental in installing mechanisms for achieving mutual adjustment between the core institutions: coordinating committees, collaborative task groups, on-farm trials and liaison officers have been mentioned. It might be added that within a small professional community like the one in Pasto, informal contacts abounded as well.

The CA abided by credit procedures which were compatible with its own national standards. The latter was the direct reason why, when a rural women programme was implemented by ICA-UNICEF, credits were not channelled through this bank but through a private organization. The collateral that, routinely, was requested by the Agricultural Bank practically inhibited them to extend credit to women (let alone to groups, which was the intention of the project), except in rare cases.

Negotiation and mutual adjustment among institutional actors as described above can not take without regular communication between them. Communication mechanisms and events were many. Representatives of DRI, ICA and CA met regularly with representatives of institutions which participated in other programmes sponsored by DRI, during meetings of the DRI Departmental Committee. This committee discussed national and departmental policy issues, programme priorities and readjustments. More important for ICA was the monthly DRI Technical Committee meeting. This committee included the directors of all institutions involved in the DRI programme. During the meetings the implementation of DRI national policies and the coordination of activities among institutions were most important. The committee had an advisory capacity as far as DRI programme decisions were concerned. DRI programme evaluations and budget talks were held bilaterally between DRI and each institution separately each year. During the three monthly National and Regional Coordinating Committees of the ICA-CCH, the core actors DRI, ICA-CCH and ICA/E met with Colombian and Dutch policy makers. Besides attending the affairs of the ICA-CCH project, these meetings served as a complement to the DRI meetings particularly where technical matters were concerned. Besides, these meetings were particularly relevant as gatherings where ad-hoc solutions to immediate problems could be designed or complementary activities to fill in blanks in already established DRI or ICA programmes.

Communication between extension workers, subject-matter specialists and researchers was taken care of during field visits and through the implementation and evaluation of on-farm trials and joined task groups. The latter were formed as interdisciplinary groups assigned to specific tasks such as designing, monitoring and evaluating on-farm trials or designing and producing didactic materials for extension purposes. For the adaptive on-station research programme on intensive dairy production, such a group was also formed, sometimes meeting as often as once a week. Moreover, subject-matter specialists played an important role in extension itself, so that intensive exposure to farmers and their opinions was guaranteed. Researchers were sometimes invited to take part as well. Monthly staff meetings were held regularly to discuss matters of policy administration. Every three months, technical staff meetings were held to discuss progress with respect to stated goals of the ICA-CCH project. ICA-CCH technical programme evaluations took place biannually, internal evaluations and budget discussions annually.

Informal communication was encouraged by putting ICA/Extension, ICA-CCH in the same office space, within the CA office building. Furthermore, informal social contacts between extension district managers, researchers, subject-matter specialists and other DRI related staff were frequent as many lived in Pasto, the departmental capital and they often had attended the same university. A number of subject-matter specialists, who had formerly worked as on-station researchers, maintained strong links with the research station staff. The fact that ICA-CCH experts continued to fulfil tasks at the experimental station as well, promoted further integration as well.

We may conclude that an effective institutional alliance was created in Nariño thanks to the combined leadership of a number of core institutions, each of which negotiated a space for itself within the common framework all adhered to. It included an effective 'platform' (Röling, 1994a,b) for achieving mutual adjustments among institutional actors, consisting in a diverse array of both formal and informal communication links. The outline of the common frame work was given by the DRI programme. By means of its control financial resources and programme priorities, it co-opted other institutional actors into its approach to improving the fate of a significant part of the small-holders in Nariño. Effectively, DRI may be said to have taken over-all leadership over the agricultural innovation process among small-holders. Yet, in practice, every one of the core institutions wielded considerable influence one way or the other. Using its expertise deftly, ICA signed for technical leadership, defining technically and economically viable options for now and for the future and showing practical results at the farm level. The ICA-CCH operated as a connection between research and extension, and as a source of external expertise and funding, which was used to increase awareness of socio-economic contingencies and different technical as well as methodological options among (national) staff and policy makers. Paraphrasing Maturana and Varela (1984), the bond between the core actors might best be described as *operational independence within a situation of structural coupling* (see also chapter two).

Resource linkages

The relevance of resource transfers in determining the outcome of innovation processes is underscored by the Nariño case study results. Firstly, it is obvious that DRI could not have played its role without its control over financial resources. Also the ICA-CCH project's influence depended heavily on its resource contribution: expertise and finance for activities which were complementary to the DRI programme such as socio-economic studies, technical support to guinea pig husbandry, the establishment of a fruit tree collection and nursery, and the production of communication programs and materials. In addition, ICA-CCH funds enabled ICA/Extension to operate more flexibly within the framework set by DRI and ICA regulations and timing. For example, before DRI credit regulations were completely clear and officially decided upon, ICA-CCH provided credit to a small number of peasant farmers who were instrumental to its socio-economic evaluation and demonstration programme. This way, valuable time was saved. The same was true for the publication of extension materials: although ICA officially had budgets to publish and print such materials, these were administered centrally at the national office and, generally, were insufficient to cover the demands from the different regions. ICA-CCH funding enabled the ICA-CCH and ICA/Extension teams in Nariño to produce and distribute their own materials. This did not only save time, it facilitated timely delivery as

well. It also made it possible to assure participation of field staff in the elaboration of the materials.

ICA's leadership was contingent upon its command of experienced personnel all over the region, and its long-standing technical expertise regarding highland agriculture. Apparently, to enable a social actor to successfully become a 'driving force' in an agricultural innovation theatre, the actor has to have 'something' to negotiate with. This definitely does not refer to financial resources alone. Effective institutional alliances, as we have seen, are not built on financial arrangements alone. It seems this 'something' can be any resource. As long as other core actors perceive it as relevant and necessary for achieving the joint mission: money, technical expertise, connections, institutional presence in a region, relevant prior experiences, ideas, etc. On the other hand, the Nariño case does not justify thinking light about the financial side of institutional alliances: the withdrawal of core funding by the Dutch Government and DRI was an important factor in throwing the into a deep crisis the alliance of social actors who, during a considerable period of time supported the technical improvement of small-holder agriculture in Nariño effectively. Other actors/alliances had to take over from there and for a number of activities such as dairy, barley and guinea pigs, they actually did (Engel, 1989b).

Secondly, the inter-institutional relationships which govern the resource transfers and/or the influence of one institution on the performance of the whole, are not mere links. They are better understood as social relationships between institutional actors who, as part of their strategizing, create technical and organizational solutions and/or blockages which help them print their mark on the course of agricultural innovation. In this sense, agricultural innovation can be understood as a continuing process of (re)negotiation over the use of relevant resources among social actors who to a certain extent perceive a common problem or concern. Given the multiple interests involved in agricultural innovation, it can be expected that in any given theatre a variety of different interpretations of this concern can be found, reflecting the world views, intentions and strategies of different actors.

Finally, it is apparent that over a particular period of time relatively stable patterns of institutional relationships exist as a result of strategic consensus among core actors with respect to: a shared mission; an agreed upon division of tasks and responsibilities; and mechanisms to achieve coordination and/or adjustment of tasks and resource allocations along the way. If the Nariño case is any indication, one would expect such patterns to include a number of closely integrated core institutions who have surrounded themselves with other social actors who share (part of their) concerns yet on their own are not able to do much about it. This provides the core institutions with the opportunity to rally these other actors into their project and hence, effectively direct the course of innovation. Once established, such *institutional configurations*[5] may be expected to enable core actors to jointly recognize problems and/or opportunities, to formulate decisions and set priorities

[5] The term 'configuration' I borrow from Mintzberg (1983) who refers to mental and spatial arrangements of organizational parts which help to understand the behaviour of the whole. 'Institutional' may refer to government, non-government or privately owned organizations who perform a function relevant to agricultural innovation.

in a coordinated manner, and to act upon them, as well as being able to experiment and innovate their joint behaviour or otherwise act as one whole. In accordance with the criteria set out by Long (Long, 1992:24-25; referring to Giddens), I suggest we seriously study the possibility of understanding such configurations as emergent social forms, which enable organizations and institutions to exert some form of collective agency.

5.3 Configurations as emergent joint management structures

Above I have argued that in complex innovation theatres relatively stable patterns of institutional relationships between social actors may emerge. I have labelled such patterns *institutional configurations*. But, what do these patterns entail? Can they be interpreted as forms of social organization? And next: do they matter? I will argue that they do. In my eyes, institutional configurations represent the closest we will find to an emergent *joint management structure* in complex innovations theatres. As a relatively stable pattern of relationships, such a configuration enables the institutions who form part of it to concentrate upon what they can do best, within an overall organizational design which lays out tasks and responsibilities for each of them, specifies the way coordination is to be achieved and which, hopefully, fits what is perceived as being a joint mission. I do not pretend to extract from such an analysis a clear-cut theory. Perhaps a diagnostic framework, contributing to meaningful analysis and discourse on leadership and coordination in complex agricultural innovation theatres.

The reason why institutional configurations evolve in the first place, has to do with perceived interdependence among core actors. This is an assertion which is not only supported by the Nariño case study, it has been brought forward by a number of authors (see for example: Kaimowitz et al., 1990). The emphasis on 'perception' underscores the *appreciative* dimension of social actors' behaviour in complex innovation theatres: DRI simply did not figure ICA/Research to be relevant to achieving its aims; relevant technologies were available on the shelf, so why spend scarce resources on research? To the contrary, the Coffee Growers' Federation of Colombia decided to invest in breeding and research to develop a rust-resistant coffee variety, three decades before the disease even entered Colombian plantations. When, in 1979, they released the new Colombia variety Federation officials avoided publicity initially. The information on the new variety was kept among researchers and policy makers. Not that they perceived the coffee growers as of little relevance, but they feared not being able to meet the demand for seeds publicity would generate. When in 1983 rust was discovered in Colombia, the situation changed dramatically: the Federation's provincial committees requested local seed multiplication sites and some took seed multiplication into their own hands (Kaimowitz, 1989).

The same way, those responsible for the National Coconut Development Programme (NCDP), designed to resuscitate Tanzania's ailing coconut industry, involved foreign funding and technical expertise in the development and delivery of improved coconut growing technology, yet, initially, did not fully involve farmers in verifying the profitability and acceptance of the technologies under farm conditions. Also, social actors engaged in marketing inputs and produce were not directly involved in the programme (Lupanga, 1990). The Nigerian Government institutions responsible for improving the

Cassava processing research and technology transfer, to the contrary, clearly believed the private (industrial) sector was to play a pivotal role in making available improved processing technology. Strong linkages with international and national private firms were therefore implemented (Ekpere and Idowu, 1990a).

I conclude that social actors responsible for designing and implementing interventions in agricultural innovation theatres differ in their appreciation of the relevance and functional interdependence of particular social actors for innovation. The ideas core actors hold with respect to the need for institutional cooperation, i.e. their 'institutional intervention model', play a role in the way configurations evolve. This becomes even clearer when we look at cases where parallel sets of social actors emerge, apparently involved in similar tasks. Aroceno-Francisco (1989) illustrates the emergence of two parallel sets of institutions involved in potato technology development and delivery in the Philippines. Both failed to integrate their efforts, as each felt nothing could be gained from working with the other. Both were independently financed and felt they were equally competent to carry out their assigned tasks. An unwillingness to follow through on agreements was the result. In another case, we found that social actors recognized three separate 'blood lines' among the actors involved in horse husbandry in the Netherlands: those involved in horse breeding and export, those involved in competitive horse riding and racing, and those involved in recreational horseback riding. Mutual interdependence among social actors belonging to the same 'blood line' was judged far greater than across 'blood lines'. The horse husbandry innovation theatre therefore contained three segments and social actors, at least those who experienced no immediate problems were content with it (Engel et al., 1990).

Only those who, for one reason or the other, hold a different view and do think such institutions should cooperate more, will take such a situation as problematic. In the horse husbandry case mentioned above, this was true for the recreational horseback riding segment which protested because its actors felt excluded from relevant knowledge and information other segments had at their disposal, and that it received a relatively small share of the government support given to the sector (Engel et al., 1990). The Philippines case shows how difficult it might be to change an already established structural arrangement: "In the mid-1980s, the situation changed. The members of these core agencies in the seed potato subsystem expressed a desire to form closer relationships. This coincided with the imminent (...) reduction of resources (...) Meetings were held to discuss plans for collaboration (...) However, no significant integration resulted. Although the people involved felt that closer integration would maximize the use of limited resources, no one really wanted to make it happen. The intense feeling of competition among the researchers continued to persist" (Arocena-Francisco, 1989:6).

Also in the Nariño case, the relevance of an *accommodation of views and interests* among core actors is apparent: strategic consensus on a declared mission; an agreed upon division of tasks and responsibilities; and agreed procedures for coordinating and, if needed, adjusting tasks and resource allocations along the way. Apparently, a 'theory of intervention' (what to achieve and how it can be done) has to be shared at least partially. Moreover, it has to be laid down in specific principles and concrete procedures to guide programme design and implementation. This requires what we may call an intensive process of *negotiation over the allocation and use of resources*, not just once but as we

have seen, permanently. The outcome of this process, the formal and informal mechanisms by which the use of resources to accomplish particular tasks is regulated, we have labelled coordinating mechanisms. Agreed upon sets of such mechanisms may vary widely from one sector to another, or from one crop to another. And they may influence innovative performance decisively (see below).

> ***Compagnie Ivoirienne des Fibres Textiles (CIDT):***
> CIDT is a mixed company in which the Government of Ivory Coast holds the majority of shares. Until 1977, CIDT dedicated itself to cotton only. In 1978 it becomes a regional development corporation for the savanna zone, responsible for all field crops. Next to cotton, it is now responsible for the improvement of rice, maize, millet, sorghum, ground nuts and yam production.
> CIDT finances cotton research directly, its budget is indexed to the price of cotton; one cotton researcher is dedicated full-time to liaising between CIDT and the research institute (IDESSA); inputs for cotton production are delivered by CIDT directly to the farmers mostly free of charge; the farmers have no choice but to use these technologies, particularly while CIDT is the only buyer of cotton; his/her only risk factor in growing cotton is the price of labour during the growing season.
> For the other crops, CIDT finances research in a rather ad-hoc fashion, based on what external financing it can get from the Government or international donors; for all non-cotton crops, one researcher serves as a liaison between the research institute and CIDT; contract farming, as in cotton, does not exist for these crops;
> At the village level, CIDT has constructed a store room in each village; it established 'chief farmers' per village as well; one CIDT extension agent attends approximately 100 peasant farmers; its total coverage is about 124 000 farmers (85%) in the savanna zone.
> The impact of this institutional reflected its design. Cotton development is successful: a farmer who wants to plant cotton has easy (and free) access to the latest technologies; intensive research and marketing support is available. New varieties, inputs and information for maize and rice are available, but problems may arise due to late arrival of inputs or differences between what farmers demand and what they get. Locally very important crops like millet, sorghum and yam receive considerably less attention, both from research and extension. Just one new variety of yam has been introduced five years ago (Source: Eponou, 1990a)

Another way to illustrate how important a well-developed arrangement of mechanisms of coordination is, is to look at what happens when a successful configuration of institutional actors is given a modified or different mission. In the above case, when, stimulated by its success in cotton development, the Ivory Coast Government modified CIDT's mandate to become a regional development corporation this didn't necessarily mean an equally successful performance in food crops (Eponou, 1990a). Not only does an institutional configuration, once established successfully, seem to demonstrate a momentum of its own. It goes on doing what it is designed to do and can do best. Also, it seems that different crops, circumstances and objectives require a different configuration of actors and relationships, even if the actors themselves are roughly the same. This is underlined by the following example from the Dominican Republic.

Rice in the Dominican Republic:
The highly successful development of the rice sector during the "Trujillo Era" (1929-1959), demonstrated the success of market led innovation. Entrepreneurial farmers took advantage of the opportunities provided by large investments in irrigation and industrial infrastructure, and the steadily increasing demand for rice by the national population. The land reform, initiated in the sixties, caused a gradual differentiation in the hitherto rather homogeneous constituency of (large) rice growers: on the one hand a category of 'private farmers' evolved with up to 31 hectares of rice; on the other hand emerged 'public farmers', beneficiaries of the land reform each with 3 hectares at the most. During the sixties and seventies several Government services were created resulting in a strengthening of policy led influence on rice innovation, particularly with respect to the public sector farmers. During the eighties, however, productivity among public farmers still lagged far behind the private sector (an average 2.58 as against 3.37 tons/ha). The Government objective of self-sufficiency in rice had not been achieved.
Taking into account the long-standing technical support by the Chinese Mission and hence, the technical strength of the actors in the rice innovation theatre, Perez L. offers various factors to explain this situation. The most important are: frequent shifts in philosophy, methodology, organization and operations of the extension service, including frequent changes of key personnel; continuous lack of resources, leading to extreme dependency on external financial donors, each of which in turn imposed their own view upon managing institutional relationships for innovation, hereby aggravating already existing discontinuities. In addition, the technology offered by the extension agencies to the public sector did not fit their production systems and conditions well enough. Finally, in a situation where on-farm prices for rice were kept low whereas input costs rose continuously, public farmers could not earn a minimum income from their crop (Source: Perez L., 1990).

In other words: an institutional alliance successful in developing and promoting improved technologies among commercial farmers does not necessary achieve the same degree of success with peasant farmers. The supportive mix of interventions and technical options they offer may not be compatible with the realities the latter farmers are to deal with. In the above case, the large entrepreneur farmers are able to reap the benefits from the opportunities the 'Trujillo Era' configuration is able to offer, others, in this case the public farmers, are not. The haphazard attempts to complement the package with government services does not change that. Case studies in several Central American countries with respect to small grain producers point into the same direction: a particular configuration of institutions serves a particular constituency well; constituencies with radically different needs and/or constraints need to go elsewhere to receive adequate support; they may have to fall back upon informal networks or direct relationships with input suppliers to obtain technical information (Jaén & Palacios, 1993). We conclude that institutional configurations, once successful, are *tailored to the needs and circumstances of a particular constituency of farmers*. Once established, to shift their focus towards a significantly different constituency requires a major rethinking of their design and a restructuring of their operations. In a way institutional configurations develop routines, customary ways of thinking and doing things, which correspond to the institutional design, the categories of beneficiaries, the technologies and the situations they know, or have learned to deal with. Such routines are laid down in particular coordinating

mechanisms such as contract farming, free or commercial distribution of inputs and services, research and extension financing, staff-farmer ratios, coordinating committees, informal information networks or liaison offices. Therefore, to effectuate a change of direction of the agricultural innovation process means to achieve a renegotiation of such principles and customs as have hitherto governed inter-institutional relationships. If not, the principles and customs underlying collective institutional behaviour may have a 'fly-wheel' effect on performance, even if intentions have changed.

Therefore, institutional configurations successful in attending to the needs of a particular category of agricultural producers, may not automatically be expected to serve other constituencies in an equally competent manner. Configurations of social actors can not simply be expected to cope with new challenges, constraints and, perhaps, a different range of technical and organizational solutions. Institutional configurations are the result of negotiations among social actors, they represent particular accommodations based on a shared idea of what has to be done, who is to benefit, why and how (a 'theory of intervention'). If successful, this proves its goodness-of-fit to a particular type of innovation in a particular situation, not necessarily its ability to deal with other objectives, other technological developments, beneficiaries and/or conditions.

A last aspect I may suggest to be relevant is the *time and situation-specific nature* of institutional configurations. As we have seen in the Nariño case, one can only speak of a configuration being stable during a certain period of time. As configurations are socially constructed accommodations, their stability depends upon the continued effective support of all actors involved. As soon as one of the core actors withdraws a significant part of its support, a new situation arises in which strategies and institutional relationships will be reviewed and, possibly, renegotiated and a realignment of actors may occur. How exactly such re-configurations occur, and how these may affect agricultural development seems to me an interesting field of empirical study.

I conclude from the above that institutional configurations can be seen as emergent forms of social organization which result from lasting relationships between individual social actors who recognize their mutual interdependence in view of some common objective or concern. A degree of appreciation of each others competencies has to develop in order to assure a minimum level of cooperation. A process of accommodation of views and interests among core actors leads to an accepted 'theory of intervention', specifying a individual tasks and responsibilities and an array of coordinating mechanisms to establish coordination and mutual adjustments between these. The coordinating mechanisms include a joint mission, priority setting and resource allocation procedures, as well as a meshwork of formal and informal communication relationships. Once consolidated, an institutional configuration demonstrates particular characteristics (such as a particular leadership pattern and being most effective in addressing the needs of particular farmer constituencies) and a momentum of its own (left to itself, conditions unchanged, it probably goes on doing what it can do best).

The concept of 'institutional configuration', I suggest, may contribute to the understanding, facilitation, and management of complex innovation theatres by drawing attention to emergent forms of social organization which are the result of lasting

interactions and accommodations among institutional actors. Institutional configurations can be interpreted as the agreed upon management structure which is constructed socially to enable a set of social actors to make decisions and act collectively. As such it forms the basis for collective forms of agency in complex innovation theatres. It provides us with an organizational perspective to unravel and discuss organized forms of interaction, and hopefully, to understand their impact upon the direction agricultural innovation takes.

5.4 Driving forces in agricultural innovation theatres: the role of institutional leadership

Several authors have discussed the predominant influence of certain types of actors upon agricultural innovation. Sims & Leonard (1990) described the situation in which the absence of external pressure, by donors and/or government for example, leads to lack of relevance of research outputs to farmer's needs, particularly those of resource poor farmers. Here, I do not consider these pressures to be external. Rather, such actors exercise a very tangible influence upon the innovation process and as a consequence, are to be included as actors within the theatre studied. Röling (1990) emphasizes the need for farmer or user control, to ensure effectiveness and relevance in technology development. Kaimowitz (1991) has suggested four types of actors capable of exerting significant pressure upon innovation processes: national policy makers, foreign (donor) agencies, farmers and their organizations and the private sector. From the cases, a fifth 'driving force' may be suggested: research and development. Often, the most important driving force behind technology development, exchange and implementation seems to be the research community itself. Technological development might then respond more to 'what is technically possible' than to 'what is socially desirable or economically feasible'. Technology push can also be due to a dominant presence of agricultural input suppliers. Röling (1990:4-6) labels "technology-driven" development situations in which international, national, government or non-governmental research and development institutions are left considerable 'room of manoeuvre' to develop their own policies and practice.

A relatively recent development, not covered by our case studies, is the considerable influence *consumers*, *tourists*, *environmentalists* and *nature conservation groups* may have upon agricultural innovation. Although their particular influence on developments in certain theatres, like the Netherlands or at the fringes of Natural Parks in Africa, is amply recognized, their role in complex innovation theatres has yet to be scrutinized. Preliminary evidence suggests, that the lines developed in this chapter could be an interesting starting point for such studies as well (Adolfse, 1992; Boonekamp and Kleis, 1992; Röling, 1993; Röling and Van der Fliert (in press); Westendorp and Röling, 1993). The influence wielded by such social actors, interesting as it is warrants further research. This however falls outside the scope of this book.

Five types of institutional leadership in agricultural innovation theatres

I conclude that at least five, maybe more, types of social actors exist which potentially have the power and means to exercise leadership and co-opt others into coordinated efforts: those who represent the market; those who formulate and implement government policies; farmers and their representatives; those who are involved in research and

development; and donor agencies. In earlier paragraphs, I have shown how forms of social organization emerge among institutional actors in complex innovation theatres which represent something close to a joint management structure for generating coordinated behaviour: institutional configurations. Also, I pointed at the strong relationship which exists between the emergence of a particular configuration of institutional actors and the capacity of core actors to exercise leadership, to accommodate their views and interests and to (co)direct the innovation process. What I intend to explore in this paragraph is whether particular types of leadership may be associated with particular coordination mechanisms, strengths and weaknesses in their joint innovative performances.

In order to answer our question we reviewed the case study materials and focused our attention upon three issues (Engel & Seegers, 1992)[6]:

(1) situations in agricultural innovation theatres where strong institutional leadership by a single one of the core actors was evident.
(2) the core actors and principal coordinating mechanisms to be associated with such situations, and,
(3) the most common problems, strengths and weaknesses, reported in such situations.

Strong institutional leadership by a single of the core actors does not mean other actors do not exercise leadership at all. It means that, in the opinion of the researchers, all factors considered, the over-all leadership of one actor was dominant in achieving and maintaining the configuration as a whole. This can be illustrated by referring to the Nariño case: I have shown (chapters 4 and 5.2) that several actors contribute crucial pieces to the 'leadership puzzle' for small-holder agricultural innovation in the Highlands. Yet, it is evident the rural development programme DRI 'pulled them together' in a (relatively) successful institutional configuration during the period 1978-1985. It did so, precisely by allowing other core actors a degree of autonomy to design and direct those activities they are good in: ICA assumed leadership over technical matters concerning small-holder agriculture, developing technical recommendations and extension programs according to its own standards; the ICA-CCH project was allowed operational autonomy as well within a common policy framework. Despite of it, I would still classify the Nariño configuration during that period a 'policy led' one, as it was DRI, the institution representing general government policy, who laid out and reinforced the common framework which set the stage for successful accommodations among actors.

Market led innovation

Where the market place is accepted as the place where the success or failure of agricultural innovation is eventually determined, those social actors who control marketing and/or processing of agricultural produce lead the pack: marketing boards; traders; trading companies or boards; agro-industries; and, increasingly, retail or fast-

[6] A note on bias: in this chapter I concentrate on forms emerging from the interaction between *institutional* actors. Since our case study materials cover settings in which governmental, sometimes private, but hardly any non-governmental agencies play a role, this is a logical enough course of action. Also, it seems adequate to our present purpose of studying leadership, power and influence in agricultural innovation theaters. Eventually, it will have to be complemented by further research, part of which is presented in chapter 6 where I study networking among non-governmental organizations for sustainable agricultural development.

food chains. This is most clearly so in the case of export crops: coffee and rice in Colombia (Kaimowitz, 1989; Agudelo, 1989); cotton and rice in Côte d'Ivoire (Eponou, 1990a); apples in Chile (Bemelmans, 1992; Chavez Tafur, 1994). Perhaps the strongest coordination mechanism in market led innovation is its focus on one or a number of 'commodities'. The 'theory of intervention' is geared towards producing a product which corresponds to (international) market standards. Research is organized in commodity research programmes. Extension approaches likewise are commodity-oriented. Specialists concentrate upon developing adequate 'technological packages'. On the work floor, coordination is achieved through cooperative agreements and/or commercial contracts between actors. Contract farming is widely adopted as a means to guarantee the use of improved technologies by producers. Company field staff and technical advisers supervise the use of prescribed technological packages and report on bottlenecks in production (Eponou, 1990a; Chavez Tafur, 1994). Where and when necessary, links with external research and extension agencies are activated. Engel (1990a), referring to the post 1985 period, provides an example of a local beer factory which finances the costs of barley research in South Colombia. Agudelo (1989) relates the cooperative agreement between the Rice Growers Association of Colombia, contracting research with CIAT and ICA. Eponou (1990a) provides examples in cotton, maize and rice.

In market led innovation theatres, generally, relatively efficient linkage arrangements seem. Orientation upon the market obliges social actors to be aware of technological developments, opportunities and to anticipate early upon possible drawbacks. Kaimowitz (1989) describes the often informal mechanisms that over a period of more than 15 years lead to the development and utilization of a rust-resistant coffee variety, as part of the Colombia Coffee Growers Federation's successful rust prevention and control strategy. Also, the funding of research and extension may simply be indexed to output figures (Eponou, 1990a). Where they are not, financing of research, development and extension tends to follow market trends closely as well. In general, the private sector spends more money on linking both than is the case of the public sector (Pray and Echeverría, 1990). Other problems such as lack of perceived interdependence and lack of leadership and focus do not appear in the case studies of market led innovation theatres.

Market led theatres do seem to present a lack of sensitivity to social and environmental problems. Core commercial actors are interested in building effective relationships with a limited number of commercial farmers, who can provide them with the products they need in the quality and quantities they need. The number of farmers involved is dictated by the market shares the core actors command at a certain point in time and by the current level of on-farm productivity. To increase the latter is normally their strategy rather than to increase the number of farmers they are involved with. Necessarily, this means they work with only a small proportion of the rural population. As a result, social differentiation is often reported as a result of otherwise successful developments of commercial agriculture. An example is given by Chavez-Tafur (1994) for the apple export sector in Chili. It is also apparent from observations of Perez (1990), who pointed at the bias in favour of commercial farmers as against 'public' farmers in the case of rice in the Dominican Republic (see 5.3). Not that core actors in market led innovation never recognize the adverse social effects of market trends. Since 1968, the Colombian Coffee Growers Federation runs the Coffee Zone Diversification and Development Program. The program helps particularly the smaller peasant producers to become less dependent upon

coffee alone. Although it has not succeeded in replacing large areas of coffee with other crops, it has had some success in promoting the production and marketing of alternative crops like fruits. Particularly for the smaller coffee producers in less competitive coffee areas this support has been important (Kaimowitz, 1989).

Another problem often associated with market led technological innovation is the deterioration of ecologically sensitive areas, such as the savannas of West-Africa or the steep slopes of the Andes in Latin America, by commercial mono-cropping systems. This problem however is not limited to market led innovation alone. Whether core actors in market led innovation theatres are willing and able to direct technological developments towards more sustainable forms of agriculture or whether such a change requires strong pressure from other actors such as government, non-government agencies or donors, is a matter of intense debate. The experience with integrated pest management in Indonesia (Van de Fliert, 1993) seems to indicate that a strong national policy pressure indeed might be necessary. Vanclay (1994) in his study of australian agricultural development, insists upon the need for such pressures to turn natural resource deterioration around.

Policy led innovation

If the course of innovation is mainly directed by the (national) government, we may speak of a policy led innovation theatre. In such cases, normally, the government is the main source of finance for research and extension, and non-governmental and commercial actors are relatively weak as far as research and development are concerned. The government imposes its leadership through the implementation of agricultural policies, regulations and/or agricultural development programmes and projects. It may do so independently or with the help of donor agencies. As a result, core actors include government bodies such as the Ministry of Planning or Agriculture and its (decentralized) agencies. Coordinating mechanisms are rooted in the ways government policies are constructed, in (national) planning and project approval procedures, in technology certification procedures, in national development programmes, in the official mandates of (semi-)government institutions and in bureaucratic procedures concerned with budget negotiations, allocation of resources, monitoring and control.

Policy led innovation theatres are often associated with large numbers of field staff, bureaucracy and lack of operational flexibility. A set of problems commonly mentioned in policy driven configurations are frequent shifts in policies, organization and approaches (Palmieri, 1990a; Perez, 1990; Lupanga and Kasonta, 1990), inadequate resources (Perez, 1990; Eponou, 1990a) and lack of integration with the private sector for marketing and input supplies (Lupanga, 1990). Institutional instability seems another very characteristic feature. Besides, a degree of marginalization of research institutions is often mentioned. Government policies are frequently based upon the assumption that technology and information is available 'on the shelf', only to be communicated to farmers for its application (Engel, 1990a). Lupanga (1990), for the case of cattle in Central Tanzania, shows how isolated research efforts may become when this happens. Palmieri (1990a) and Perez (1990) report on the limited value of the technological recommendation to farmers as a result of the lack of cooperation between research and extension agencies in policy driven theatres. Status differences between researchers and extensionists are often reported, but their impact is not judged very important. In case research and extension are

financed from different, independent sources (donors for example), coordination problems may be aggravated when mutual interdependence is not recognized.

Just like market led innovation, policy led innovation may contribute to social differentiation. Also government programmes fit the intentions and conditions of some farmers better than others. The delivery of improved technology to between 10-15% of the peasant families in the Nariño Highlands was an impressive success for the ICA-DRI Programme between 1975 and 1987 (Engel, 1990a). Most of the technical improvements, however, required the small-holder to obtain credit to make the necessary investments. In such a way, not access to technology limits the technical innovation, but limited access to credit. As a result, only those small-holders which obtained access to credit, could possibly benefit from the programme. Azucena argues a similar case for corn in the Philippines (1989). Moreover, in policy led innovation theatres, generally, effective influence of farmers themselves upon the course of agricultural innovation remains exceptional. On the other hand, policy led innovation may be more sensitive to national priorities. Such priorities may concern social welfare and equity, ecological sustainability, or the production of staple food crops. A good example of policy led innovation able to accommodated quickly to new demands of ecological sustainability is described by Van de Fliert (1993). In a relatively brief period of time considerable progress was made in replacing pesticide based strategies among small-holders with integrated pest management strategies, due to strong support from the central government.

Farmer led innovation

Here, leadership is in the hands of farmers. Most case study evidence from the ISNAR RTTL study in developing countries points at a *lack of farmer influence* rather than effective leadership by farmers. Naturally, innovative farmers play a role, as individuals. The obstacles impeding effective farmer participation in the development of alternative technologies are many. This is not because farmers are not active innovators. Pijnenburg (1988) for example shows how colonists acquire new knowledge relevant to their farming of areas completely unknown to them before, without the intervention of one single institutional actor. Informal links between farmers, and when possible with institutions, are documented by Box (1990). Stolzenbach (1992) describes the way small-holders in Mali learn by improvising and evaluating new options continuously. Brouwers (1993) describes and analyzes how small farmers in Benin learn and adapt their agricultural practices. The reason is more likely a lack of 'listening' skills and respect for farmers' knowledge on the side of agricultural institutions and professionals (Engel, 1990b).

The coordinating mechanisms governing farmer led innovation have been given particular attention lately. Millar (1992) points at the role indigenous knowledge and beliefs play in decision-making with respect to on-farm innovation. Ashby (1990) and Khan (1992), for small-holders in Colombia and Pakistan respectively, point at the gap between farmers and researchers views on priorities for innovating agricultural practices. Biggs (1989) describes different modes of research-farmer interaction, from contracting farmers' services to perform scientific experiments to strengthening farmers' informal research. Informal networks between researchers, extensionists and farmers play an important role (Box, 1990). Besides, examples from The Netherlands and Chile demonstrate how farmers form study groups and keep frequent contact with extensionists and researchers (Grooters, 1990; Altmann, 1989). Grooters demonstrates also how relationship patterns

may develop historically in different ways: in the horticultural sector in the Netherlands, farmers influence research programming mostly through informal networks and contacts; to the contrary, in the pig husbandry sector farmers make use of formal mechanisms, such as participation in the directory of the research station and budget approval procedures, to make their choice of priorities count and informal contacts are less important (Grooters, 1990).

One may argue that innovation theatres led by farmers' associations and cooperatives, such as the Colombian Coffee Growers Association, fit the category of farmer led innovation. However, where such farmer organizations acquire strong influence on the basis of their economic power, for example as an important export industry, farmer control seems often to become secondary to market control. In order to survive, such organizations are required to operate as agri-businesses, giving priority to market demands over those of, for example, small farmers. Moreover, the influence of farmers in such businesses is often limited to a small number of leaders, generally larger entrepreneurs or agricultural professionals. The case studies include a number of cases which show how originally farmer driven theatres chose such a market orientation and became industry driven, in the case of the coffee growers of Colombia, without forgetting to direct specific programmes at its 'roots' in the farming community, attempting to counteract some of the adverse social consequences of economic decisions made on the basis of industrial priorities (Kaimowitz, 1989). In other cases, cooperatives may consider it in their interest to attend particular groups of resource poor farmers, as is the of COOPROLACTEOS, the milk processing cooperative in the south of Colombia.

Often, the problems associated with (mostly) farmer driven theatres have to do with the quality of the farmers' organizations themselves, their capacity to effectively make decisions on technology development, their relationship with the rank-and-file membership and their representativeness in view of the variety of farmers' interests that exist in agriculture. Village groups, farmers associations and cooperatives may often reflect the interests of the somewhat better-off farmers within the community better than others. A large part of the membership may fail to recognize their immediate concerns in the modernization policies of their organization. Such arguments are often put forward with respect to non-governmental organizations as well. As a result, both farmers' organizations and local NGOs may be under considerable pressure from their members to achieve real improvements in farm level income within a brief period of time. Therefore, they may tend to channel resources to projects which promise immediate results rather than supporting projects which promise medium or long term results only. Experience suggests that farmers' cooperatives have to grow fairly large and market-oriented before they are able to label considerable amounts of finance to research and development. Therefore, lack of resources is another prevalent issue when farmer led innovation is discussed. Unless research and development costs can be related directly to economic returns, farmers' associations generally lack funds and depend upon financial support from intermediary agencies. After an extensive study of the rise and fall of local farmer cooperatives in Nariño, Moreno and Villota (1984) concludes that one of the main reasons why in resource-poor farming communities farmer organizations are slow to emerge and hard to be maintained, is the discontinuity in the support from intermediary (government) agencies.

Research and development led innovation

Here, decisions about the course of innovation are mostly in the hands of researchers. Research institutions are given a relatively free hand to determine their priorities, research approach and the way they link with other actors in order to disseminate their results. The influence research institutions can wield is rooted basically in the type of technologies and technical recommendations they are able to offer, and the value these add to the performance of different types of actors in the theatre. When they offer technologies for which considerable investments or expenses are necessary, they will only be able to improve the farm practices of those farmers who have access to financial resources. If they concentrate upon low-external-input-agriculture, they might lose out on interest from the most commercially oriented farmers. Coordination of tasks in R&D led innovation theatres is rooted mainly in the definition of what a 'competent' researcher is and does: his or her prior qualifications, the accepted research approaches (such as on-station experimental research, farming systems research, on-farm research), accepted research protocols (such as plot designs, data collection methods, data processing routines) and the type of results expected (new varieties, fundamental or applied scientific publications, practical recommendations, etc.).

In R&D led innovation one may perhaps distinguish between two general currents, each with different ways of dividing and coordinating tasks: technology *push* and technology *development*. The difference is in the type of articulations built amongst key actors. Technology push assumes ready-to-disseminate technological packages to be available or to be easily compiled. Dissemination strategies are designed following the 'linear model' (Röling, 1993): technologies are developed by research, transferred by extension to farmers, who adopt them. If necessary, feedback is given and passed back up the chain. To the contrary, technology *development* assumes no easy replicability of technological packages but the need for local (re)design and (re)development of technologies to suit specific local conditions, available opportunities and skills. Strategies are based upon the sharing of experiences, knowledge and information among relevant actors so that effective technological solutions to location-specific problems may emerge locally (Alders et al., 1993). The world-wide LEISA network is just one example of such an approach (Reijntjes et al, 1992). The difference is in the role the farmers and other sources of indigenous knowledge play. Researchers emphasize *participatory methods* so that local actors may co-direct innovation. The development of such methods has received significant attention during the last decade, for example: Biggs (1989); Haverkort et al. (1991); Jiggins and De Zeeuw (1992); Merrill-Sands & Kaimowitz (1989). Farmer influence can be upgraded when more attention is paid to creating adequate 'learning settings'(Rap, 1992).

A strong point often associated with R&D driven configurations is their flexibility in dealing with complex and diverse agro-ecological and social environments. Their capacity to develop "tailor-made" technology, fitting the needs and possibilities of specific groups of farmers, goes largely unquestioned. However, its weakness seems to be in replicating its results. While appropriate technological solutions are developed on a small scale, their wider application lags behind. Links with extension workers and their agencies may be complicated (Lupanga and Kasonta, 1990). As a consequence, a very limited number of farmers actually reap the benefit of R&D led developments. Replication of such the efforts to the community at large, would often imply an inhibitory high cost per farmer in terms of research and extension personnel and finances. Farmer control over research is

generally limited to those innovative farmers who participate in on-farm research programmes.

Donor led innovation

In some situations, donors hold the key to innovation. Through selective funding of particular research and development activities and through the recruitment and allocation of technical personnel, donors may influence the course of innovation directly. More indirectly, donors bring in equipment and install infrastructure to facilitate particular types of research, may pay extra allowances to field staff, or may recruit particular technical experts to evaluate project performance, this way influencing the course of innovation decisively. Shetto (1992: 70) concludes that in Mbozi district, Mbeya region, Tanzania: "Donor funding and policy orientations have a strong influence on the direction of performance of research and extension". Amongst other things, this resulted in very little research on traditional crops like finger millet, sweet potatoes, cassava and sorghum; plant protection and soil research were directed mostly at priority crops and agro-engineering was seen as tractorisation. Post-harvest techniques received little attention.

A constraint often associated with donor led innovation is lack of institutional sustainability. Inter-institutional cooperation, even if successful, may collapse upon the donor's withdrawal (Engel, 1990a). Perez (1990) mentions the lack of continuity in approach, caused by dependence upon ever varying sources of external financing. Shetto (pers.comm.) puts her finger on the same issue: each project evaluation, or a change of (expatriate) personnel, may cause significant shifts in focus. Important coordinating mechanisms, such as project committees, task forces, extension approaches, lending policies, may change 'overnight'. As a result, donor driven theatres are praised for their flexibility and focus yet, at the same time loathed for their discontinuity and trendiness. Research efforts in donor driven theatres are mostly directed at applied and adaptive rather than fundamental research (cf. Lupanga & Kasonta, 1990). It befits the assumption - often at the core of donor 'theories of intervention' - to develop within a relatively brief period of time, effective ways of doing things and then to transfer responsibility for continuing the work to government agencies. Within the context of such short term target orientation, resource allocations are generally adequate. Lack of familiarity with local circumstances may sometimes hamper effective operations. Particularly when the projects are of too short a duration.

Mostly, research and extension activities which are coordinated through the donor projects, use mechanisms such as project coordination committees, project allowances for field staff, better transportation and communication facilities, foreign advisers and superior equipment to direct and coordinate the planning and implementation of tasks. The mission to be accomplished, participating institutions, and coordinating mechanisms generally receive ample attention during project negotiations. User control in donor driven configurations is as variable as its approaches to extension and research, and very sensitive to trends in the donor community as well. It is often difficult for donors to build up strong, independent user organizations that are able to survive the donor's withdrawal. Successful strategies included the formation of organizations on a commercial basis and the transfer of (part of the) donor tasks and responsibilities, with the corresponding resources, to national non-governmental organizations. Both COOPROLACTEOS and CORFAS were established in Nariño with support of the Dutch Government, but, once

established, succeeded in negotiating national support from DRI to extend their operations significantly (Engel, 1990a).

The role of leadership and coordination in complex innovation theatres

I conclude from the above that institutional leadership does matter indeed. Different social actors are potentially in a position to influence the direction innovation processes take. Their ways of achieving such an influence differ: *farmers* depend upon their capacity to organize themselves into groups with enough clout to pressure other actors to take their views seriously, or otherwise require intermediaries, such as non-governmental development organizations, to articulate their views and bring them to the attention of other relevant actors. *Market actors*, i.e. actors who control marketing or processing channels for agricultural produce, influence innovation processes through the prices they pay, the technological packages they recommend and the quality standards they apply. Besides, where necessary they use their financial resources to coordinate with or among other actors. National *policy makers* exercise leadership through formulating and implementing policies, conditioning the allocation of government budgets, by setting priorities and otherwise laying down rules and regulations and see to it they are put into practice. *Research and development actors* affect the opportunities of other actors through the type of technologies they offer or, alternatively, are willing to study and develop. Depending upon specific circumstances, this set of actors might include commercial companies as well: input suppliers, seed multiplication companies, etc. *Donor agencies*, finally, use their financial resources and know-how as leverage to impose coordination upon those actors in the agricultural innovation theatre they consider relevant to their mission. Given the fact that in most theatres at least a number of such social actors as mentioned above play a role of significance simultaneously, it seems obvious that to bring about and maintain coordination of tasks in complex agricultural innovation theatres is a complex social phenomenon.

I conclude that the relevance of institutional leadership in complex innovation theatres lies in its power to influence the course of innovation. Through a number of mechanisms, leading social actors may effectively influence the decisions made by other actors with respect to innovation. The exercise of such influence leads to the gradual development of a pattern of relationships between social actors who perceive each other as relevant to their cause. As a consequence, particular configurations evolve which represent the way in which tasks among social actors are defined and coordinated. Such configurations are structural arrangements in which accommodations among actors are 'stored'. It reflects the accepted models and ground rules for collective behaviour with respect to agricultural innovation.

Besides, my arguments underline the role particular types of leadership play in creating such configurations. As far as institutional configurations are concerned, the evidence suggests that distinct core actors, specific coordinating mechanisms and characteristic strengths and weaknesses in the innovative performance of the theatre as a whole may be associated with particular types of leadership. I therefore propose the following hypothesis instrumental to the study of institutional configurations in complex innovation theatres: where one single type of social actor commands the social interaction for innovation effectively, characteristic one-sided configurations emerge which demonstrate particular

strengths and weaknesses. In the next paragraph I will propose an instrument to analyze configurations of actors and relationships for innovation along these lines.

5.5 Basic configurations: a conceptual tool for studying leadership and coordination in complex innovation theatres

With the use of the above hypothesis I propose to construct a number of ideal-types: hypothetical descriptions of institutional configurations in which the balance of power is extremely skew in favour of one single type of institutional actor. Following my hypothesis, such theoretical constructs would specify coordinating mechanisms as well as strengths and weaknesses related to innovative performance, characteristic to such a configuration. These ideal-types, I suggest, will allow us to single out the intricate ways in which different types of actors impose their leadership in concrete situations and its possible consequences for agricultural development. Its purpose being first of all, to debate the actual balance of power between relevant social actors as far as innovative performance is concerned, and secondly, to explore its impact upon the course of agricultural innovation. I label these ideal-typical configurations *basic configurations*. For now, I will limit myself to five distinct types: industry driven, farmer driven, policy driven, research and development driven and donor driven basic configurations.

For each of the above, a particular set of dominant core actors, a particular pattern of relationships, particular coordinating mechanisms and particular strengths and weaknesses will be specified. In the following paragraphs, I will outline what such a definition would entail. Then I will briefly discuss the scope and possible uses of the basic configurations. Finally, I will compare my constructs with those proposed by Mintzberg (1983), and presented in chapter two (2.4) and discuss some similarities and differences between the two approaches.

Five basic configurations

Industry[7] *driven configurations:* the social actors who control access to the markets for agricultural produce may be traders, retailers, marketing boards and/or agro-industries. Sometimes, consumer organizations play a role. Therefore, these and the entrepeneurial farmers they work with form the core of the industry driven configuration. Their relationships dominate the theatre: innovations are promoted which increase the profit margins of the participants in the 'product chain'. This does not imply necessarily an increase in profitability at the farm level: innovation might have to be implemented to improve the logistics of evacuating the produce (on-farm milk collection tanks, for example) or to comply with international standards of product quality ('haricots verts' for the French market from small irrigation schemes in Africa, for example). Entrepreneur farmers are not necessarily large-scale or rich farmers, but farmers with a more commercial outlook who see their farm as a way to earn a cash income and who take profitability as a central yardstick to measure their performance. They might even be contract farmers. Generally, agro-commercial or agro-industrial establishments actively

[7] As not the 'market' itself but the social actors who control access to it are the ones in the drivers' seat, I prefer the term 'industry', as a "branch of trade or manufacture" (Fowler & Fowler, 1964).

take part in the development and transfer of technologies. Research and extension is financed mostly from, and often even indexed to market sales. As the quantity and quality of the produce on the (world) market is what determines returns for the sector, one would expect the *standardization of agricultural products* and *production technology* to be the main coordination mechanisms. The aim of technological developments is generally to increase productivity and competitiveness. As a consequence, agriculture is split up in sectors and sub sectors, each producing a narrow range of agricultural commodities: dairy, pigs, potato, grains, cotton, etc. An even more sophisticated pattern may evolve when interdependent actors articulate their efforts in *production chains* to serve particular markets with products of a guaranteed quality. Market-orientation is a strong point of these configurations, lack of sensitivity to social differentiation and long term ecological deterioration are suggested as possible weak points.

Policy driven configurations: core social actors are (1) representatives of the national government; (2) government or non-government extension agencies and (3) demonstration farmers. Their articulation within the framework set by government agricultural policies or programmes dominates interaction. Demonstration farmers are selected on the basis of their (expected) ability to demonstrate the advantages of adopting the technology recommended by the programme. They represent a wider rural constituency we may label programme farmers, i.e. those farmers whose interests are believed to be served by the current agricultural development programme. Industrial actors generally do not take an active part in innovation efforts by such configurations. Research may play a secondary role, as technologies are believed to be available 'on the shelf' and actors simply have to be trained to use them. Coordination is established by seeing to the *standardization, upgrading and supervision of field staff performance* and the *standardization of technological packages*. Administrative and technical specialists therefore play an important role. The resulting configuration often manifests a rigid definition of tasks and hierarchical administrative, technical and operational controls. Sensitivity to policy decision-making is a strong characteristic of such configurations, bureaucracy and inefficient use of resources are suggested as possibly weak point.

Farmer driven configurations: The relationships between (1) farmers' leaders (2) farmers' organizations and (3) agricultural policy makers are dominant. Extension and research are less prominent in decision-making about agricultural innovation. Farmers' leaders represent a wider rural constituency of farmers who are organized into farmers organizations of different kinds. Such organizations may be unions, cooperatives, associations or functional groups. As long as they are able to effectively influence other actors relevant to agricultural innovation. Coordination is brought about probably through *standardization of interests:* the farmer's organizations will strongly articulate their needs at the different levels, if possible, forcing other actors to adjust their activities. Another is *standardization of norms*: When ideological overtones dominate the defense of farmer's interests, the configuration may start to resemble the *missionary form* indicated by Mintzberg (1983: 294). Integration within the local community and the utilization of local knowledge and management capacity can be strengths of such configurations, however, in the case of resource poor farmers, the need for sustained technical and economic support from intermediary organizations and a possible danger of overemphasizing immediate results to the expense of long term gains is possibly imminent. Strong farmer driven

configurations seem to emerge around strong economic activities, such as coffee exports or milk processing in Colombia. Although resource-poor farmers may be members of such organizations, the configuration then resembles an industry driven one more than a farmer driven one.

Research and development driven: core actors are (1) international and (2) national research & development institutes, governmental and/or non-governmental, and (3) innovative farmers. They may operate according to a technology push or a technology development approach. In the former, new technologies originate from an research and are transferred to farmers by extension. In the latter, improved technologies originate from a network of farmers supported by development organizations. Commercial or industrial actors and extension agencies are often only marginally involved in R&D driven theatres. The rural constituency of R&D driven configurations are technologically oriented farmers who like to develop and improve upon their farming operations and skills, not necessarily with an eye on immediate pay-offs. Traditionally, the principal coordinating mechanism in research and development driven configurations seems to be the *standardization of skills*. Agencies emphasize the quality and skills of their staff and their freedom to work as they see fit. Staff recruitment and training are the agencies' most important instruments to guarantee quality of innovative performance. Work processes, i.e. approaches and research methodologies vary widely: from disciplinary, on-station research to interdisciplinary, on-farm and farming systems research. Amongst the case studies, on-farm and farming systems research are most frequent. The strength of a research driven configuration of social actors seems to lie in its capacity to develop appropriate technologies for a particular category of farmers, if researchers and farmers remain in close contact, its main weakness in the lack of replicability of its results.

Donor driven configurations: where donors have a predominant influence upon the course of innovation, core actors are (1) foreign or national donor agencies, (2) agricultural projects and (3) demonstration farmers. Again, the main rural constituency can be described as *programme farmers*, those who, by nature of their conditions and interests, fit the profile the donor agency had in mind when designing its interventions. An agricultural project or programme is often created as a temporary "support structure" to make sure donor interests and intentions are safeguarded. Of course, different donors prefer different coordinating mechanisms. Some donors emphasize the importance of flexibility and mutual adjustment - a tendency to avoid formalities and go for concrete actions - within a general framework of strategic objectives, tasks and targets. Others emphasize the standardization of all work processes, both in the institutions and on the farm, and strict administrative and technical control. Most are task-oriented, in order to achieve concrete results in a relatively brief period of time. Generally, donor projects are able to adapt to changing circumstances and are given some freedom to search for the most appropriate approach to tackle the problems they encounter. However, where donors bring in considerable amounts of resources the sustainability of their programmes after they have withdrawn becomes critical.

Possibilities for use

Freezing an otherwise extremely complex and dynamic range of situations into a limited number of frames of course implies simplification. Moreover, I think the strength of the basic configuration concept is not in its unequivocal precision nor in the unambiguity of

its categories. Rather, I may suggest, it is its contribution to critical reflection upon the practical implementation of power and influence in complex theatres of agricultural innovation. It seems particularly useful to elucidate and debate actual leadership patterns, changes in the institutional balance of forces, appropriate mechanisms to accomplish inter-institutional coordination and the impact of (lack of) leadership upon the course of agricultural innovation:

(1) Basic configurations may help make *multiple leadership patterns* explicit. They are not mutually exclusive: at any given moment, any number of institutions may effectively exercise influence over certain pivotal elements of the innovation process. Their operational autonomy must possibly be seen as a fundamental strength in the social organization of the agricultural innovation (Engel, 1990a). When each of these actors would exert full control, a *basic* configuration would emerge. Yet, at the same time each of them trades part of their autonomy for improved performance as a whole. That is the reason why through a process of accommodations among social actors an institutional configuration emerges. To be most effective, this configuration has to build upon the strengths of each of its (prospective) participants. In other words, it will allow each actor to 'lead' in those tasks it is best suited for. As a direct consequence, successful configurations of institutional actors usually demonstrate multiple leadership: each of the core actors takes the lead in particular tasks and strives to impose such mechanisms of coordination as it sees fit to accomplish those tasks in the best possible way. Consequently, studying the leadership balance of a successful configuration is often more relevant than studying the role a single one of the leading actors plays. The basic configurations can help to do this: take the Nariño case study; it provided an example of shared leadership between DRI, ICA and ICA-CCH (see 5.2), even if DRI could be said to have dominated the theatre during the period 1978-1985. By studying the relevance of each of the basic configurations for explaining the ideas and events in the Nariño theatre, the type of leadership exercised by each of the core actors, its relative strength and impact upon innovative performance can be studied and debated, and improvements may be suggested.

(2) Similarly, basic configurations may help to identify *gaps in leadership patterns*. They help the analyst recognize a number of driving forces potentially relevant to successful performance in complex innovation theatres. For example, the apparent lack of articulation with market actors, such as traders, retailers and (export) industries:

> ***Coconut development in Tanzania:***
> When the Tanzanian Government decides to implement the National Coconut Development Programme (NCDP), it does so because: *By the late 1970s, the coconut industry was in serious decline. It was generally agreed that the decline (...) was due to an overage palm population, pests, lethal disease of palms in some areas, lack of improved planting materials, poor crop husbandry, poor pricing, lack of research effort, ineffective marketing channels and lack of a unit for development and policy*. To remedy this situation, NCDP was designed to identify, develop and disseminate improved coconut production technology. Noticeably enough, by 1989, no specific articulation of market actors to the programme had yet taken place (Source: Lupanga, 1990).

In the absence of formal articulations with market actors, the basic configurations then stimulate the analyst to question whether market forces do not wield any type of influence at all upon the innovation process, or whether in fact this influence is organized through informal mechanisms, beyond the scope of the NCDP programme. They might furthermore ask what (positive or negative) impact such an arrangement has upon the programme's ability to achieve its objective, the revitalization of the coconut industry in Tanzania, and by which specific coordination mechanisms this impact is achieved. Finally, if such a suggestion seems justified, they might propose alternative strategies to improve the situation.

(3) Also the use of the notion of basic configurations may help to elucidate *changes in leadership patterns*: leadership in complex innovation theatres is time and situation specific. We have shown that the stability in relationships in institutional configurations is temporary. Configurations exist as long as the relevant social actors decide to maintain them. Nevertheless, they are never static, as the relationships between the actors are continuously reinterpreted, renegotiated and reconstructed. As a consequence, the balance of power is reconstituted all the time, even though over-all leadership is often maintained by the same institution(s). With every new committee, liaison device, task group, subject-matter specialist, on-farm trial series, resource allocation or contracting procedure (to name just a few) or to the contrary, with the abolishment of such a mechanism, the delicate balance of leadership in innovation is affected. Nariño provides an example of a shift in the balance of technical leadership in favour of specialists at the provincial level through the modification of a standard approval procedure for extension publications:

> ***The approval of extension publications in Nariño:***
> Within the National Agricultural Institute (ICA) written extension materials routinely had to pass through a procedure which required a minimum of 47 actions by people from 8 different units at all levels of the organization, before the national publication bureau (PUBLEICA) would authorize its printing and distribution under ICA's name. In Nariño, during the period 1978-1985 a strongly modified procedure was agreed upon, putting quality control for locally designed and used extension materials in the hands of provincial research and extension specialists, so that the materials could be easily updated locally and made available in time for each years' campaign. This helped reinforce local initiative and influence upon technical recommendations to small-holder farmers by means of decentralized control over the production and distribution of technical extension materials (Source: Engel, 1989b).

The impact of such a move can be studied in terms of whose influence upon innovation is strengthened by it and whose is not. The basic configurations suggest a number of key issues to enhance such a discussion.

(4) Finally, basic configurations may help identify possible strengths and weaknesses of a particular institutional configuration with regard to innovative performance. Through its close fit to different types of innovation and their common *strengths and weaknesses* (5.4), basic configurations may help to draw attention to possible 'soft spots' and opportunities in current institutional arrangements. Nariño provides an example in which

a weakness of the dominant policy led innovation process could be remedied by drawing in reinforcements from elsewhere:

> ***Complementing the policy drive in Nariño:***
> One way the DRI programme effectively directed the course of innovation in the Nariño Highlands was through setting priorities: Dairy, pastures, wheat/barley, potatoes, maize, beans were identified as priorities for adaptive research and extension. DRI linked its budget allocations for staff and operational costs to these priorities: only staff and activities for priority sectors were taken as a justification for demanding and obtaining financial resources. As both ICA/Extension and the Agricultural Bank (for its main small-holder programme) were fully financed by DRI, this presented a strong mechanism to direct innovative performance: there simply was no money for loans, adaptive research and/or extension on other than the priority sectors. However, as happens often in policy driven configurations, it also reduced the programme's flexibility to work on other promising alternatives. To improve guinea pig husbandry, identified as a promising option for peasant farmers in Nariño already during the sixties, complementary staff and financing were drawn into the innovation theatre from Dutch bilateral sources (Engel, 1989b).

Scope and limitations
Basic configurations are ideal-types, abstract constructs. They are not intended to provide the student with an account of what *is* in the world. They provide a diagnostic framework the purpose of which is to reflect upon the impact of current relationship patterns upon the course of innovation, as a basis for designing useful accommodations and/or interventions. Therefore, it is important that basic configurations are taken as complementary views, not as mutually exclusive models. At any given moment, I have argued, a particular configuration can reflect the characteristics of several types of leadership and hence, can be analyzed from the point of view of several basic configurations. Moreover, given the appreciative character of complex innovation theatres, different social actors generate a different view on leadership and a different understanding of the way coordination is achieved, even in the same theatre. These views might be quite disparate or even to a large extent incompatible. Yet the core question is **not**: *Who's perception is right?* but rather *Whose perception is more relevant?* and eventually: *Which perception accommodates the perspectives of most?* Diversity will emerge, both in the ways problems are perceived and in the intentions which, at a particular point in time, guide the innovation process.

A diagnostic instrument, therefore, is to raise relevant issues for such a debate. It can not provide a blueprint of how innovative interaction should be organized, if at all such a model would be imaginable. A blue-print approach would necessarily bend the discussion in favour of those social actors whose intentions and routines happen to coincide with it. It should be a heuristic tool to help the social actors understand their diverse interests, concerns and their own interactions better. In my view, it is exactly in a confrontation of such views and perceptions on leadership and coordination within the context of a participatory action-research project, that relevant new insights and effective intervention strategies emerge to arrive at an accepted, and effective joint management structure. My proposal is that the basic configurations as a tool fit such intentions and circumstance.

Table 11: A conceptual tool: basic configurations and their main characteristics summarized

Configuration type: /Characte-ristics:	*Industry driven*	*Policy driven*	*Farmer driven*	*Research & Development driven*	*Donor driven*
Principal coordinating mechanisms	standardization of outputs/ technical packages	direct supervision, stand. of work processes/ technical packages	stand. of interests, norms	stand. of skills/ education	mutual adjustment, stand. of technical packages/ skills, work processes
Dominant leaders:	market actors	agric. policy makers	farmers' organizations	(inter)national research	donors
Core actors:	agro-commerce/ industry, entrepreneur farmers	agric. policy/ extension/ demo farmers	agric. policy/ farmers' leaders	agric. research/ innovative farmers	agric. project/ demo farmers
Rural con-stituency:	commercial farmers	program farmers	organized farmers	technological farmers	program farmers
Principal source of power/ influence:	market articulations prices, quality control, resources	policies/ rules & regulations, resources	political clout/ resources	(improved) technology, technical expertise	financial resources, technical expertise
'Leitmotiv' for innovation:	efficiency/ output quality	policy objectives	farmers' needs	technical advance-ment	intervention objectives
Accountability to:	individual balance sheet	gov't policies	farmers' inte-rests	research community	donor policies

I do not pretend that the basic configurations as constructed here are the only ones which could possibly be conceptualized. In this respect, I differ from Mintzberg (1983) who seems to imply that the dynamics of organisations can be framed adequately into a maximum number of six fundamentally different structural arrangements. I believe the variety of ideas, forms and shapes in complex agricultural innovation theatres makes it unthinkable to envisage such a simplification. Also, I have already suggested at least four more 'basic configurations' may be constructed: When we look at agricultural development, consumer driven, environmentalist driven, recreation driven or nature activist driven basic configuration are as imaginable as the ones we already defined. Moreover, one may rightfully criticize our inclusion of 'local knowledge led' innovation in the 'farmer driven configuration'. It is no secret that others than local farmers play an important role in farm-based innovation, such as priests, sooth-sayers and other local specialists (Millar, 1992; Brouwers, 1993). Yet, not all types of innovative leadership are as yet equally well researched. A more comprehensive, empirical exploration of such possibilities would be of great interest but falls outside the scope of this study.

Mintzberg, a comparison

The instrument we propose is similar to Mintzberg's (1983) conceptualization of organisational configurations: clusters of prime coordinating mechanisms, main organisational design parameters and situational factors, as a result of strategizing by different key parts within organizations. In fact, his book inspired me to look at agricultural innovation theatres from a more organisational perspective. Yet I felt a strict analysis using his conceptualization of configurations and coordination could not be applied to agricultural innovation without a more qualitative, empirical study first. The 'primary process' I am interested in, agricultural innovation, does not fall within the scope of a single organization. Even if I propose to look at it as a 'socially organized' phenomenon. Therefore, I propose to make a quick U-turn and compare what has emerged as 'meaningful discourse' on inter-institutional interaction for innovation with Mintzberg's conceptualization of intra-organizational interaction for performance. For such a comparison, I have to limit myself to basic configurations as combinations of core actors and coordinating mechanisms, elements that appeared very clearly from our analysis. The material I have at my disposal does not allow an analysis of design parameters and situational factors.

Institutional configurations in agricultural innovation theatres are obviously affected by design. However, such refers to 'social design' achieved through a diffuse, social process of interaction, rather than a rationally planned 'organisational design'. Besides, whereas configurations are the closest we can get to a joint management structure in complex innovation theatres, a unified management structure such as we may find in one organization they are not. The socially organized innovation process can not be managed as a company. At the same time, a great number of organizational issues can be debated usefully with regard to institutional configurations. Clearly, the comparison between organizational behaviour and socially organized behaviour merits more attention. In the following I will have a brief look at three fundamental elements of Mintzberg's approach: the organisational configurations, the basic 'pulls' and their influence upon the form the organisation takes, and the coordinating mechanisms.

I have described institutional configurations as relatively stable patterns of institutional relationships over a particular period of time as a result of strategic consensus among core actors. Mintzberg (1983) points at 'natural clusters, or configurations' of coordinating mechanisms, design parameters, and situational factors. While my definition stresses the emergent, social nature of inter-institutional relationships, Mintzberg's approach underscores the design-dependent nature of relationships between parts of an organisation. In my view, each can be taken as a point on a range of structural arrangements from 'purely' socially constructed to 'purely' rationally designed. An institutional configuration emerges socially, yet many relationships and coordinating mechanisms which hold it together are the result of thoughtful design by one or more social actors involved. Likewise, organisations might be the result of rational design, yet many of the issues raised by Mintzberg point at the socially constructed nature of organizations. The difference is gradual, not absolute.

I have also shown that at least five types of institutional actors may exercise leadership and 'drive' the institutional configuration into different directions. The similarity with Mintzberg's five 'pulls' is striking. Core actors would be the equivalent to 'key parts of

the organization' in his approach. This opens very interesting vistas upon institutional behaviour in innovation theatres. Can it be argued that the drive imposed by research and development actors is comparable to the pull the 'technostructure' exercises upon the rest of the organization, emphasizing the standardization of work processes (i.e. extension approaches, technical packages and on-farm research techniques) and pushing innovation theatres towards the form of a machine-bureaucracy, where specialists (economists, communication specialists, agronomists, animal husbandry specialists) call the shots and operators (extensionists) are to comply or quit? Is it possible policy-level actors prefer monitoring and direct supervision in order to maximize their control, leading configurations to resemble 'simple structures'? Can a trend towards 'balkanization' be recognized when looking at commodity-oriented agricultural innovation theatres? Also, can it be argued that field workers, if left to themselves, would seek to professionalize and push the configuration towards the form of a 'professional bureaucracy'? Finally, would it be unthinkable to argue that donors seek to wield maximum influence by emphasizing flexibility and mutual adjustment, preferring a theatre to operate as an 'adhocracy'? While these questions are without doubt meaningful and merit further attention, it is also clear from our earlier discussions that a clear cut, one-to-one relationship between one type of leadership and one predominant type of coordination mechanism is not supported by our materials.

To the contrary, coordinating mechanisms are very diverse. Mintzberg's distinction does make sense to characterize them. In chapter three I highlighted the underlying structure of professional information use, the 'main menu', and the influence of previous education and in-service training upon its appearance (p. 3.8). A characteristic case of 'standardization of work processes'. We have indicated as well the importance of 'mutual adjustment' amongst extensionists and farmers in the case of the information portfolio. In the case of Nariño, the importance of arriving at a strategic consensus on priorities for intervention, on the definition of the target group, etc. was underlined, an example of 'standardization of norms' for intervention. The relevant contribution of linkage mechanisms such as on-farm trials and collaborative task groups corroborates Mintzberg's assertion that in recent years a whole set of devices has been developed to encourage liaison contacts for 'mutual adjustment'. Apparently this is not the case in industrial corporations only. From the personnel policies of institutional actors in agricultural innovation theatres we know the importance of 'standardization of skills' in its most basic, diploma-oriented manner. The Training and Visit System, also, emphasizes this particular mechanism strongly, next to its emphasis on 'direct supervision', standardization of 'work processes' and 'outputs', the latter generally referred to as 'technological packages' of 'technical recommendation packages'.

Finally, the concept of basic configurations I propose as an analytical tool answers to the claim Mintzberg makes for the configurations he distinguishes: "... the configurations represent a set of five forces that pull organizations in five different directions" (Mintzberg, 1983: 285; parenthesis by PE). If we leave out 'five' and substitute 'innovation theatres' for 'organizations', this is exactly what we claim our basic configurations do. In his last chapter Mintzberg also, indicated a sixth candidate 'pull'. We would suggest that, at least as far as complex innovation theatres are concerned, the total number of relevant pulls remains an issue for debate and research. Yet, the 'closeness-of-fit' between both approaches underscores the relevance of studying complex

innovation theatres not only from a social perspective, but from a constructivist one. Complex agricultural innovation theatres are deeply affected by human sense-making and organizational designs. To overlook those designs in our analysis would be an enormous mistake.

From the above, as well as from my many discussions on the issue with experienced colleagues from Latin America, Africa, Asia and Europe, I propose three conclusions:

(1) Mintzberg's approach permits a meaningful debate and deepening of the study of leadership and coordination in complex innovation theatres. Of course, our examples have referred to environments where institutional actors dominate. One may expect 'standardization' and 'supervision' to play a more dominant role there. Therefore, I am cautious not to extend my conclusions to other than inter-institutional interaction. Still, it is remarkable that the cry for greater flexibility, pragmatism and decentralization in the current agricultural development debate is as strong as in Mintzberg's (and others') analysis of large organizations. I expect a further development of configurational analysis as proposed in this chapter to benefit from a more detailed comparison and possibly a closer integration with Mintzberg's theory.

(2) the distinction between socially organized, and organisational behaviour needs further attention. This will most probably lead to important amendments of Mintzberg's theory for complex innovation theatres. We already saw we are to deviate from Mintzberg (1983) in one important aspect: configurations in agricultural innovation theatres are not 'in fives' (or sixes). We have identified five types of social actors capable of leading agricultural innovation, but we have already identified four more candidates. Also, we have learned that standardization of norms, mentioned by Mintzberg almost as an afterthought, in our cases may play a predominant role. It points directly at the importance of cultural issues for accomplishing innovation. This might be more the case in socially organized innovation theatres. It might also be a consequence of Mintzberg's strong emphasis on 'structure' (as against 'culture') as a domain of inquiry.

(3) in complex agricultural innovation theatres, at first sight, there seems to be no one-to-one relationship between a single prime coordinating mechanism and the type of leadership or 'pull' exercised. In the process of negotiation and accommodation which leads to the establishment of institutional configurations, perhaps more than in the establishment of an organization, social actors do not seem to 'put all their eggs in one basket'. Rather, they seem to recur to a variety of types of formal and informal mechanisms to reinforce their leadership. On the other hand, I do not exclude the possibility that the combinations of drives found in agricultural innovation theatres may be dissected further and a clearer picture may emerge. Within the scope of this study, however, we will not pursue this line of empirical study any further.

5.6 Preliminary conclusions

The relevance of institutional leadership in complex innovation theatres lies in its power to influence the course of innovation. Through a number of mechanisms, leading social actors may effectively influence the decisions made by other actors with respect to innovation. Such mechanisms are very diverse, they range from administrative procedures, informal meetings, coordinating and liaison committees, joint task groups, study clubs and field work approaches to government policies, budget allocations, price regulations, quality controls and monitoring and evaluation procedures, to name just a few examples. By implication, such influence leads to the gradual development of a pattern of more or less durable relationships between social actors who perceive each other as relevant. As a consequence, configurations of actors and relationships evolve which represent the way in which tasks among social actors are defined and coordinated. Such configurations are structural arrangements which reflect the accepted views, models and ground rules for collective institutional behaviour with respect to (a particular type of) agricultural innovation.

Our findings strongly suggest that institutional configurations in agriculture are multiple ones. Generally, a number of social actors interact more or less intensely to direct the course of innovation. Accommodations among such actors on the basis of perceived interdependence and not the subordination of all to the most powerful one, seems to lead to the emergence of successful institutional configurations. Therefore, collective agency in complex innovation theatre can not be understood unless multiple leadership is taken into account. Each social actor contributes a different piece to the 'jig-saw' puzzle named innovation. Whereas particular institutions may take over-all leadership in terms of policy and its implementation, other institutions are to fill in the 'blanks'. What the 'blanks' are, how relevant each one of them is and which social actor is most competent to fill it, are issues for continuous, and often heated debate among relevant actors. As a result, institutional arrangements are continuously renegotiated and adapted, both formally and informally. Apart from its multiplicity, this underscores the appreciative and dynamic character of institutional configurations and the balance of power which influences agricultural innovation at any one moment in time.

Moreover, the role particular types of leadership play in creating particular types of institutional configurations has been underscored. It can be argued that each type of leadership tends to favour the use of particular mechanisms to coordinate innovative tasks. In turn, innovation processes evolving as a result of effective leadership of one particular type, show characteristic strengths and weaknesses. The concept of 'basic configurations' is built upon these findings and is proposed to serve as an instrument to analyze institutional configurations in practical situations. As innovation in agricultural production emerges and re-emerges continuously as the result of ongoing social interaction between relatively autonomous actors in rural areas, we may use configurational analysis to study how institutional alliances are formed, how these are appreciated and sustained (or, to the contrary quenched to oblivion) and how these structural arrangements enable or disable core actors to effectively direct technological development in agriculture. To support my claim that the instrument serves practical purposes of analysis and reflection, I demonstrated how it fits the interpretation of ideas and events as we know them in

complex agricultural innovation theatres, and how using it leads to meaningful discourse on leadership and coordination in relation to competent performance in innovation.

I propose the configurations we have discussed represent an emergent joint management structure in complex innovation theatres. It enables core social actors, to a certain degree, to act collectively with respect to agricultural innovation. Therefore, I propose to label such configurations *innovation configurations*. However, at the same time an established configuration may exclude other actors from significantly influencing the course of agricultural innovation. Therefore, configurational analysis as proposed here represents an important tool for gaining an understanding the practical implementation of power and influence in innovation theatres. Naturally, it has to be developed further. In the first place we have mostly studied a particular type of configuration, the institutional one in which government agencies play a dominant role. We have limited ourselves to pointing out other possibilities without (as yet) studying them. As a second step, in chapter six we will study innovative alliances between non-governmental development organizations. Our experience suggests that Mintzberg's theory of organizational structuration might be helpful, but would have to be amended. As it is, configurational analysis seems a powerful tool to study some of the more structural aspects of collective agency in complex innovation theatres. By way of conclusion, let me suggest some implications of this for research methodology.

As indicated above, the configuration concept in my view should not be taken as a description of how the world *is*, but as a perspective to study and debate the social interaction among relevant institutions and its impact upon the course of agricultural innovation. As a 'window' it can help explain issues of coordination and leadership in complex innovation theatres. It fits within a soft systems action-research methodology. Besides, given the appreciative and socially constructed character of both the innovation process itself and its social organization, it seems that such issues are most effectively debated among social actors who are actual stakeholders in the innovation process. Configurational analysis is therefore probably most effective in a participatory action-research setting, where stakeholders become co-researchers of the social organization of innovation. Nevertheless thesis work by students of our department has demonstrated its contribution to more conventional field research as well (Shetto, 1992; Mirikhoozani, 1993; Chavez, 1994). In chapter 10, I will return to this issue.

6. *Daring to share: networking among non-governmental development organizations*[1]

6.1 Introduction

During the last decade or so, the social organization of innovation has been in flux. In most European countries, the fruits of scientific research are increasingly looked upon as commodities to be exchanged commercially, Government budgets for agricultural research and extension are reduced and privatization is pushed forward. In Latin America, non-governmental organizations virtually took over technical and economic support to low resource farmers as government extension services were drastically reduced or even eliminated. In Asia and Africa, governments have invested heavily in agricultural research and extension. The maintenance costs are however so high that, here also, the search for alternatives ways of financing agricultural research and extension is high on most policy makers' agendas. In my view, there are two main reasons for this preoccupation with change: the first is the heavy drain on national budgets these large agricultural institutions represent; the second is the difficulty these same institutions have in meeting the challenges of modern agricultural development. In short, the way in which agricultural innovation is organized is increasingly seen as too costly and in addition, inadequate.

As a result, in many countries traditional actors withdraw (somewhat) and other social actors get involved such as non-governmental agencies and agro-industries, and different types of alliances for innovation emerge. In this chapter I want to study such a new type of alliance: networks among non-governmental development organizations (NGDOs)[2]. In many countries, non-governmental development organizations have taken the lead in search of agricultural technologies for small farmers which are socially, economically as well as ecologically sustainable. Among these NGDOs networking has gained momentum as a way of organizing support to small farmers more effectively. In this chapter I will review a number of networking experiences and argue that NGDO networks can be understood as emergent forms of social organization for innovation, well suited to situations in which objectives are unclear or strongly contested between relevant parties. My research offers two lines of argumentation to support this claim. Firstly, networking has demonstrated promising results in a variety of practical settings (Alders et al., 1993). Secondly, networking is a strong alternative because it resembles so closely what social

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[1] This chapter is based on Engel, 1993b*: Daring to share..*

[2] I will use NGDO for non-governmental development organizations and NGO for non-government organizations in general; the difference is that NGDO dedicate themselves mostly to development activities with farmers and farm families at the grass roots level; NGO may be active at any level, local, provincial, national and international.

actors, people and organizations, do to innovate their practices anyway. To the second argument I return in chapter 7. In this chapter I will concentrate on the first.

Networking for sustainable agriculture: the case studies

I will review the emergence of five NGDO networks for sustainable agricultural development in developing countries: the Ecological Agriculture Network RAE (Kolmans, 1993), and the Andean Council for Ecological Management CAME (Manrique et al., 1993), both in Perú, South America; the Association of Church Development Projects ACDEP in Northern Ghana (Alebikiya, 1993), and the Arid Lands Information Network ALIN (Graham, 1993), both in West Africa; and Networking for Low-External-Input-and-Sustainable-Agriculture in Tamil Nadu and Pondicherry Region, India (Quintal and Ghandimathi, 1993). In their case studies, members of these networks describe why they decided to form a network and how they did it. They discussed their preliminary reports during a workshop held in Sri Lanka late 1992. Their final reports and a first synthesis were published in the fall of 1993 (Alders et al., 1993). All these networking experiences focus on networking for sustainable agriculture, although they do not necessarily define 'sustainable' in exactly the same manner. They all work with resource-poor farmers yet under a variety of circumstances and with differing institutional support as will become apparent further on. Besides, all these networks have in common that they have reached a stage of consolidation. All of them have successfully transcended the risks and uncertainties of institutional infancy, and matured into respected adolescence, carving out a 'niche' for themselves in the local, regional, and/or global NGDO community.

My main interest will be to look for the value added to NGDO activities by networking, and how this is done. To underscore that many of issues I point at are not particular only to the five networks I studied, I include some references to 'El Taller' a world-wide network of NGDO the establishment of which I was able to participate in closely as an adviser. The chapter is constructed as follows: first, I will specify what I mean when I say 'networking' amongst NGDOs, and why I think networking is *work*, not something to be left to occupy our spare moments; then, I want to look into current networking experiences in order to draw out some of the central issues which appear, when we attempt to look at networking as a *purposive* activity; thirdly, I will make an attempt to draw out what the added value of networking is. This added value, I contend, has to be sought particularly in the contribution of networking to creating a space for joint learning and innovation.

6.2 Networking: what are we talking about?

Networks have received a lot of attention lately. Plucknett et al. (1990) was among the first to recognize the importance of networks between agricultural scientists. Networks among farmers, extensionists and researchers were studied systematically by Box (1990). Students of social networks highlight how people 'capitalize upon' their social relationships in order to deal with the challenges life throws at them. Some would say we have finally understood the importance of investing in 'social capital' (Bourdieux, 1991). However, my primary interest is not with networks as such. Rather, I want to look at *networking*, the process resulting from the conscious efforts of certain social actors to build relationships with each other in order to enhance sustainable development. I

consider networks the more or less formalized, more or less durable relational patterns that emerge as a result of such purposive relation building efforts. From this point of view, the success or failure of networking, its functioning and characteristics, and the exact form and shape the actual networks take, may be evaluated against the *mission* its constituting actors have in mind for it.

> ***'El Taller': the movement, the network, the centre..***
> In the discussions during the 3 'think-tanks' which preceded the establishment of the 'El Taller' Foundation, now based in Tunis with a membership of more than 100 NGDOs worldwide, NGDO leaders stressed various times the importance to steer free of power politics through El Taller. Political lobbying, although very high on the agenda of most NGDOs involved, was seen as something which had to be done by individual members, on a case to case basis, forming alliances with those other organizations - member NGOs or otherwise - which seemed most useful in achieving certain preset objectives. At the same time, El Taller was not to duplicate efforts of member NGOs, including networks, in providing services and/or products to the poor. El Taller was to concentrate on creating a platform to facilitate reflection and the exchange of experiences between NGDO staff from different countries and continents, in order to enhance 'global thinking for local action'.
> Source: Reports El Taller, 1990/1993.

However, in order for networking activities to correspond to a mission, these same actors must be able to formulate a joint one. That is, the question of who may or may not be a *constituting actor* - having the right to co-determine the ground rules or 'constitution' for the network - has to be solved, and a procedure must be agreed upon for developing a *shared perspective*, or a 'theory of poverty' as Tim Brodhead puts it (quoted in: Korten, 1993). Such questions often are not dealt with very explicitly by those constituting a network. And as most networks start off very informally, they don't have to. Often, networks evolve around a closely knit group of charismatic leaders. They, initially, determine who is 'in' and who is 'out', and set the agenda for network activities. However, when networks become more permanent and more institutionalized, the need to develop more transparent, and more widely participatory ways of generating such decisions arises.

Mario Padrón (1991), one of the outstanding networkers of Latin America, was among the very first to recognize the need for more systematic analysis of networks, because "it is difficult to establish what they are, why they happen, their main characteristics, and how their relative strengths can best be used to develop the NGO community's efficiency and to increase the communication and organizational strengths of the networks". He suggests a central thesis to the understanding of NGDO networking: networking is about sharing. And he warns: "... sharing may be one of the most demanding requirements in development work, yet it is the most essential common denominator developed by the poor in order to provide for each other and live under adverse conditions". *Daring to share*, as he puts it, is neither easy nor automatic, it requires a willingness to be open-minded, it requires having enough confidence in one's own work to expose it to others, and at the same time, the necessary humility to understand one's position as one among many. In my view, this makes networking to be more than simply working together between individuals and institutions on the basis of agreed interests. It does have to do

with achieving 'social synergy' (Haverkort and Ducommun, 1990). Networks represent 'communities of ideas', a space for like-minded people to interact on the basis of common interests, mutual trust and anticipated concern. Not so much the manufacture of products and/or services, but social learning, communication, and sense-making are 'core businesses'. In focusing on 'mind' rather than 'matter', networking helps create a fundamentally new quality to human cooperation. It enhances inclusive thinking, creativity, and dialogue.

Any attempt to understand and manage networks which overlooks this fundamental issue is bound to misinterpret the interests behind the networking of NGOs. This is not to deny the importance of specifying products and services in the realm of networking. To the contrary, such tangible activities provide indicators to assess the dynamics and eventual success of network activities. But the understanding of networks can never be reduced to the simple 'production' logic so commonplace in institutional thinking today. The added value of networking is strongly tied to the development of ideas, to shared experiential learning, and to making sense of the world through communication. In the following paragraphs, I review the case studies and ask myself what makes it worthwhile to *net*work in the view of the NGDO themselves, in addition to simply work? I will look into this issue by raising 3 questions:

(1) What triggers networking efforts amongst NGDO?
(2) What makes NGDO networks take a more permanent form and stay?
(3) What activities of NGDO network organizations are most characteristic?

6.3 What triggers networking efforts amongst NGDO?

At first sight, the networks seem to surge from situations where the NGDO themselves, or members of their staff, perceive a critical lack of access to relevant knowledge and experiences from others. Yet, at the same time, this lack is not looked upon as absolute or irrevocable. On the contrary, it is perceived as being surmountable when a sharing of ideas, experiences, and information is organized amongst relevant parties. In other words, if information sharing and learning amongst relevant NGDOs is improved.

In India, NGOs and farmers agreed that many sound traditional practices exist which need to be brought to light and are worth disseminating (Quintal and Gandhimathi, 1993). Another case in point is CAME in Perú (Manrigue et al., 1993): severe droughts and inundations convinced NGDO of their incapacity to adequately respond to the Andean peasants' needs. They attributed this failure, on the one hand, to lack of familiarity with Andean and LEISA technologies, the particularities of the environment, and the ways to manage climatic risks, and, on the other hand, to lack of inter-institutional coordination. Another example is the recognition, on the part of the participants of the Oxfam Cotonou Workshop, of the isolated condition in which local project staff had to do their work, which gave rise to the formation of the ALIN network (Graham, 1993).

In some cases a more general lack of coordination is signalled to have pushed networking efforts. Sometimes coordination of vital tasks amongst NGDOs is recognized to be weak, not only in terms of technical focus, but in management and logistics as well, as was the case of ACDEP:

> ***ACDEP: inadequate coordination:***
> "... coordination had a number of inherent limitations and weaknesses: The projects operated in isolation, (...) tended to replicate programmes and (...) operate similar activities within the same locality. (...) Coordination tended to be based on the vertical administrative structure of the church and parish. (...) coordinators (...) could not provide technical backup (...) varied and different development approaches (existed) without the benefit of learning process between projects. Policies regarding the delivery of services were conflicting and tended to undermine each other. (...) parallel and sometimes inefficient and costly services.(...) different prices for the same inputs. A coordinated voice on agricultural development policies was absent" (Alebikiya, 1993).

In such cases, network organizations are pushed to assume a much more comprehensive role of facilitating organizational integration and change. Often leading to the establishment of new specialized units or agencies, dedicated to certain well-specified tasks in support of all NGDOs concerned.

However, it would stop short of recognizing the entire scope of intentions behind NGDO networking efforts, when only a relative, and critical deprivation of knowledge and information, or even services, is pointed out as a motivation for networking. An even more important dimension seems to be the awareness amongst a number of like-minded NGDOs, that the situation they are faced with in their work in the communities, requires new, more comprehensive insights and a more profound understanding of the options for sustainable development open to their clienteles. In the CAME case, as we have seen above, it was the realization that the NGDO community didn't command an adequate enough understanding of Andean and LEISA technologies, nor of the options available to peasants to manage resources and risks, in order to be able to support the rural communities effectively. In India, it was the ecological breakdown due to 'modern' agricultural techniques, the crisis situations which resulted from it, and the lack of appropriate and sustainable alternatives, which raised awareness that "... a local network would enhance the speed and quality of field action and motivate others who are interested in the concept of LEISA" (Quintal and Gandhimathi, 1993).

> ***El Taller: a space for reflection:***
> In global NGDO networking, the same thought has been on the mind of the founding members of EL TALLER, as expressed by the Secretary-General, Sjef Theunis: "EL TALLER was born from the need for reflection voiced by NGO leaders from around the world. Women and men who work at the heart of their society are feeling that citizens and politicians have lost their direction and focus". (Source: El Taller, 1993, foreword Secretary General)

Networking, from this point of view, is very much carried by the wish to jointly search for new ways of understanding and intervening in complex development situations. The motivation to start networking is the wish to (eventually) articulate an alternative approach to sustainable development. In many cases, a specific conceptual framework, or 'theory' is adopted in order to provide guidance in developing such an approach: LEISA, in the cases of ACDEP, CAME, Tamil Nadu and Pondicherry Region, and 'ecological agricul-

ture', in the case of RAE. In other cases, a more loose set of 'guiding principles' is formulated.

As it seems, the awareness of a lack of focus often coincides with the realization of a critical lack of access to relevant experiences, knowledge and information to create a powerful motivation for networking amongst NGDO. A question remains to be addressed however: Who are the ones to become 'aware', to notice the 'lack of ...', and why do they to act upon it? As we will discuss further on, such NGDO and individuals may be labelled 'prime movers' (Padrón, 1991) or 'network catalysts' (Korten, 1993). These may be local NGDOs or national ones, acting out of an awareness of crisis or immediate need, but also NGDOs who perceive an opportunity to increase their impact: In the case of RAE, the Ecological Agriculture Network (Perú), a number of experienced NGDOs sensed the opportunity to increase their impact through linking into the work of about 200 local NGDO active in rural areas, as external interest in their practical experiences with ecological agriculture grew (Kolmans, 1993).

A last recurrent item in the discussions with respect to what triggers NGDOs to network, is the wish to participate in the public, and/or governmental development debate. Manrique et al. (1993) express the same for the regional level: the network was, amongst other reasons, created because of "... the wish of its members to trascend their limited or isolated level and to make themselves heard or noted within the regional society, on the basis of proposals or suggestions for development policies". NGDO have become aware of the fact that to effectively achieve such participation, is beyond the scope and competence of any single NGDO, and requires a wide range of like-minded NGDO to cooperate.

While with respect to earlier issues, networks show a remarkable degree of similarity, with respect this, some remarkable differences occur. In Peru, CAME proposes the development of joint policies on LEISA and the role of NGDO, in face of international and national developments (Manrique et al., 1993). Similarly, the RAE network, through conferences, publications, and articles wants to contribute to the public development debate (Kolmans, 1993). In Ghana, first priority is rather to address Government institutions, and to "..advocate the need for support of community-focused development work on behalf of the rural poor." (Alebiyika, 1993). Other networks, however, like ALIN in Africa and the networking for LEISA in Tamil Nadu and Pondicherry Region, India, seem to place much less emphasis on such activities for the moment.

The three U's: motivations to network

As a conclusion to my first question I suggest that networking efforts are triggered when three types of appreciations gain sufficient momentum amongst NGDO leaders, staff, and clienteles:

(1) the existence of a relative, but critical deprivation of access to experiences, knowledge, and information of others, perceived as detrimental to effective individual performance;

(2) the need to jointly gain a more comprehensive, and more effective understanding of the complex problem situations NGDOs are dealing with, and to create new innovative options for supporting grass roots development.

(3) the wish to work out alternative development proposals, rooted in NGDO grass roots experiences, and voice these in regional, national or international debates, in order to contribute to the formulation of effective development policies.

The first leads to the wish to *upgrade* collective NGDO performance. It leads networkers to place much emphasis on documenting and sharing ideas, experiences and knowledge from such people, NGDO or otherwise, as are deemed relevant to the purpose of the network. Its main concern is with improving collective learning and the quality of NGDO work. The second involves the wish to *'upstream'* analysis and actions (Hazel Henderson, quoted in: Korten, 1993). It takes on the relevance or efficacy of the field operations themselves, within the prevailing social and political context in the country or region. It goes "... beyond the evident consequences of the problem at hand to address its source" (Korten, 1993). It emphasizes shared diagnosis, reflection, sense-making, and coordination at a strategic level. Its main concern is achieving a better understanding of complex development situations, an achievement seen as beyond the powers and scope of any one of the single agencies alone. In line with the above, the third leads to what may be labelled an *'upshift'* amongst NGDOs. It emphasizes the need for articulating and advocating alternative development proposals. It leads networkers to engage in communication activities to reach a wider public, and to influence governmental and private actors in society at large.

All three U's reflect, one way or the other, a genuine concern with improving the *quality and impact* of NGDO work, and of their contribution to grass roots development. However, as we will see later on, it is also very clear, that each network as such reflects a very particular 'brand', or combination of the above, from the local network of service oriented NGDOs, mostly interested in upgrading their performance vis-a-vis their clients, to the global strategic networks (Korten, 1993) which almost entirely embrace upstreaming and advocacy, directing their efforts to a very particular case or concern.

6.4 What makes networks stay?

If, as we claim, networks are the more or less formalized, more or less durable relational patterns that emerge as a result of networking efforts, we may also ask: why do certain networking efforts lead to the effective establishment of institutionalized networks, and others don't? Many networks have been designed and initiated which have quickly petered out as initial momentum was lost, and (prospective) members went back to 'business as usual'. This may be perfectly healthy: if a network has achieved its purpose, it may dissolve itself. Yet, the many which have survived may teach us some lessons about the conditions which have to be met for networking activities to become more institutionalized, and less incidental.

Before going into this, I would like to address an issue, which is raised frequently in the debates around networking, particularly by those arguing against it. Networks, they claim, are informal patterns of relationships and for that exact reason should not be formalized, nor institutionalized. In my view, this is exactly why we have to distinguish between networks and networking. Every individual, every organization engages in building relationships with others, i.e. in networking, for many different reasons. Most of

these activities remain informal and rather incidental. Some, however, acquire such relevance to the life and/or work of these individuals and organizations, that they decide to institutionalize them in order to guarantee a more permanent facility. Claiming that networks should remain informal always, is equivalent to saying people should eat, but never to buy food.

Formal networks, then, are not always necessary as a prerequisite to, nor as a result of, networking activities. Yet, under which conditions do patterns of relationships become more formal, and do they take the shape of institutionalized networks? For the types of networks this chapter is concerned with, a first condition has been extensively discussed in the previous paragraph: a considerable number of people have to share the view that networking will add a specific value to their work. These people, moreover, must be in a position *to articulate such views and to design a mission for the network.*

This seems to be a common denominator for all networks to start with. All seem to start with a phase of 'planned activism' (Manrique et al., 1993). A phase in which first exchanges of ideas take place; concrete activities lead to recognition of the value of sharing with, and support by others; one or a small group of enthusiastic *prime movers* promotes the idea of networking; and a meeting with prospective network members is prepared. During this phase, a lot is done, but often in a rather unplanned fashion. The result of it is, generally, a workshop or a meeting where, amongst other more immediate interest, the idea of forming a network is discussed and evaluated.

The extent to which this phase can be rather spontaneous and unsystematic depends to a great degree on the scale of the operation. While regional, and even national NGDOs may get themselves organized for a network in a very informal manner, international efforts, like EL TALLER, take years of programmed activities in order to prepare for the foundation of the network. Yet, though the scale differs, the mechanisms seem pretty much the same: the combined efforts of a group of *prime movers*, *network facilitators*, and *interested (prospective) members* lead to the formulation of ideas, plans, and activities which, eventually result in the establishment of the network. 'Prime movers', I take here as the people, generally leading members of respected NGDOs, who participate in creating the idea and the vision upon which the network is to be built. The 'network facilitators' are those which, by virtue of the space allowed to them by their own organizations, engage in actual networking, organizing and supporting a first run of activities closely tuned into the needs and wishes of the prospective members of the network. In some cases, 'prime movers' and 'network facilitators' are partly the same people. Mostly, the 'facilitation function' is done by a secretariat connected to one of the 'prime mover' NGDO involved in the networking efforts. It will always require, either directly or indirectly, a *sponsor* in order to cover (part of) the operational costs of 'planned activism'.

During the phase of planned activism, a number of recurrent issues emerge. First, the importance of *communication and participatory methods*. In order for the network to be carried by a wide group of NGDOs and their staff, these have to be allowed to participate intensively in the formulation of its objectives, approach, and organization. This looks easier than it is in practice: for those working in often isolated rural areas, to take time and develop a custom for sharing ideas and experiences with others from elsewhere is not

easy. Also, the time and energy required for doing this, often competes with already overloaded agendas.

However, the more difficult, yet essential task seems to be the development of a shared *conceptual framework* which facilitates the exchange of ideas, experiences, and knowledge. Enrique Kolmans (1993) describes the RAE experience, and notes the unrealistic goal setting and the extensive - theoretical - discussions during the first year of preparations. But he also indicates why these were necessary: to overcome ignorance and lack of information on the topic of ecological agriculture amongst prospective members; to overcome 'one-sided' views like *all that is traditional & Andean, is ecological and sustainable* (interpr. PE); to integrate social/anthropological ways of thinking with insight in technical/ecological processes; and, last but not least, to explain to donors and other supporters the actual needs of rural people. In my view, what Kolmans is referring to is a process of making sense out of the idea to set up a network to stimulate sustainable development, checking the actual need for it, and defining its potential in supporting its members in doing their work better. It means developing a 'theory of joint intervention' which makes sense to everybody. It takes a lot of time, yet seems an essential ingredient of networking. In a way, it helps to transform a diverse set of people and organizations with an 'ill-defined' sense of purpose, into a 'like-minded' group with a shared perspective which has agreed upon a number of tasks and responsibilities and has learned to respect each other.

In all cases this process is linked closely to *concrete activities* the (prospective) members of the network are already performing in their respective areas. "The immediate needs arising from the field work of each of the institutions, are the basis and reason for being a network" (Manrique et al., 1993). From the very start networking activities are to provide support to the actual work the NGDOs do. Only this way can the potential, and intended value of networking be evaluated by them, and set against their other obligations. Only then can the principal of reciprocity be applied from the very first instant: "... when an NGO (member) doesn't contribute (to the network), the network can't (effectively) support the NGO" (Manrique et al., 1993; words in () added, PE).

In a more general way, the creation and facilitation of networks of NGDOs to help increase the quality of development interventions, should reflect such guiding principles as the NGDOs themselves apply to their work. 'Positive technological elements of traditional and modern agriculture, which fit the social, economic and ecological criteria' eventually served as a 'catch phrase' for setting the agricultural standards underlying RAE network (Kolmans, 1993). In this case, as in many others, concrete activities meant direct support to field level projects. Obviously, more important than the actual choice of words in setting out general principles, is the discussion on their significance and meaning, and the implications of adopting them as guiding principles for developing the network.

> ***El Taller: principles and concrete activities:***
> In the case of EL TALLER such key values were formulated during the first 'think-tank' meeting as: internationalization; (open) communication; solidarity; awareness of one's own identity as non-governmental organizations; reflection; and education. Concrete activities were (inter)national seminars and workshops, and training courses (Source: El Taller, 1990).

The phase of planned activism is possibly the most difficult phase for a financial donor to support. Exactly *because* of the necessarily ill-defined nature of such initiatives, and *because* no shared frame of reference, values, and discourse, has yet been developed, the network will not be able to articulate its process, services, and products in a way wholly satisfactory to a donor. During this phase, what a network needs is a *sponsor*. It needs financial support of an institution which is prepared to be a 'prime mover' at the donor level, without interfering too much in network preparations. In the case of El Taller, NOVIB, a Dutch NGO, played this role, financing initial El Taller activities without (too) many ties attached. Such a sponsor, rather than 'knowing' the network is going to be a success, shares the 'belief' that the network is going to be of value to the work of the NGDOs involved. In most cases I know of, a considerable investment was made, either directly or indirectly or both, by financial donors to support the networking initiatives of a number of NGDOs, not necessarily all of these being supported by them financially, believing the network would take off, rather than knowing this for a fact. The use of *seed money* by ILEIA, the Netherlands, to support network building in India during its initial stages, is a good example of such sponsoring (Quintal and Gandhimathi, 1993).

'A good beginning is half the job'

The above Dutch saying seems to sum up network building nicely. The foundation of a successful network is laid at the beginning, not by pushing things as fast as possible, but by taking one step at the time. Creating a successful and lasting network seems to imply at least the following:

(1) Planned activism, facilitating and supporting, never replacing or passing by concrete activities already performed by the NGDOs involved;

(2) Energy, time, and opportunity to discuss, negotiate, and agree upon a shared perspective, a conceptual framework, and guiding principles, which permit formulating the mission of the network in such a way as to be transparent and agreeable to all or most (prospective) members;

(3) A body of prime movers, network facilitators, prospective members, and sponsors, willing and able to carry the networking process through its first 'ill-defined' phase;

(4) Broad, effective participation of (prospective) members designing and implementing network activities;

(5) A number of enthusiastic network facilitators, equipped with the minimum resources required to establish and maintain vital communication facilities, to create opportunities for interaction, to stimulate participation, and to otherwise orchestrate the network definition process.

6.5 Which activities characterize network organizations?

Networks span an enormous range of activities: from technical consultancy to communication, from project planning to education and training, from newsletters to conferences, from advocacy to monitoring, to name just a few. This is one of the reasons why it is hard to make sense of networking as a phenomenon. From the case studies it appears however that networks generally concentrate themselves upon 4 different clusters of activities: (1) learning-through-joint-reflection; (2) services; (3) advocacy; (4) network management.

Learning-through-joint-reflection
This embraces all activities aimed at joint reflection to increase the level of understanding of the complex situations participating NGDOs are dealing with. The objective of enhancing learning is to increase the quality of their operations by facilitating a sharing of knowledge, ideas and experiences, making use of the combined analytical powers of staff members from like-minded NGDOs. It may include mutual appraisals, exchange visits, workshops, meetings and conferences. Sometimes permanent working groups on specific topics are installed as well. Accents between networks differ, but common elements are *problem appreciation*, *diagnosis*, *exchange*, *reflection*, and *systematization*. Many networks stress the importance of visits and workshops not as ends in themselves, but as a starting-point for reflection (Graham, 1993). A situation diagnosis and an inventory of available technological and methodological options would generally be part of it. A gradual systematization, or even standardization of scientific and technical principles is often part of it as well (Kolmans, 1993; Manrique et al., 1993).

Services
Services refer mostly to training, communication, documentation, and information services. In providing these services, the network organization tries to make optimum use of existing capabilities and facilities amongst its members, and, if necessary from elsewhere. A needs assessment and/or a diagnosis of strengths and weaknesses amongst network members would generally serve as a starting-point. Typically, the network secretariat is attached to the member NGDOs considered most capable of running its most important services. The servicing function is supported by what might be called the *network communication infrastructure*. Almost all networks carry a newsletter, which supports the exchange of ideas and practices. Documentation and library services are general as well, as is the development of training materials. Methodological support to field workers may also be included, as well as technical and project consultancies (Manrique et al., 1993), monitoring, quality certification (Kolmans, 1993), or coordination of input supplies (Alebiyika, 1993). The common denominator in the services provided by networks is their close response to immediate needs of the participating NGDOs. Therefore, apart from a general emphasis on training, communication, documentation, and information, network-specific packages of services evolve in each particular case.

Advocacy
Advocacy refers to those activities performed or facilitated by the network organization on behalf of its members, to participate in the public or governmental development debate. It requires the network to formulate proposals on contemporary development issues and voice these in the public media. For the same reason, the network may organize conferences, contribute articles to scientific journals, and distribute relevant publications. Coalition building with relevant parties from outside the network, or other networks is often on the agenda as well. The advocacy function of current NGDO networks is not as generalized, or as transparent as its learning and services functions. As we have seen above, NGDO leaders may chose *not* to include advocacy among the tasks of the network they are building.

However, strategic networking gains a lot of momentum (Korten, 1993). One may indeed recognize the potential for conflicts of interest between a service-orientation at the one

hand, and the advocacy function at the other, as Korten does. And as such, a dedication to advocacy in a network is very much a matter of *choice*. Yet, from the materials I have at my disposal, it doesn't seem an 'either/or' choice at all. Advocacy and services are very much two sides of the same medal in networking: if we take 'learning-through-joint-reflection' as the core of networking, how could we possibly do without either one? What does seem to happen in the more permanent networks, is a greater emphasis upon the services and learning functions, particularly during the early stages of network development. 'Planned activism' has to be oriented towards providing 'value for energy', in order for NGDOs to be able and willing to participate in networking efforts. Moreover, a shared understanding, based upon mutual support and learning, might well be a prerequisite to effective advocacy in the first place.

Network management

Finally, 'network management' refers to facilitating the networking process itself, including care for network communication infrastructure, network operating procedures, the monitoring of network resources, activities and outputs, and the coordination with other organizations and networks. Without going deep into this matter, let me point out a number of common characteristics in network management, as they transpire from the cases. First and foremost it is the emphasis on *distributed intelligence* which catches the eye. Networking secretariats are kept as lean as possible, delegating as many tasks as possible to member organizations. Decentralization of functions and autonomy of members is emphasized continuously. The network facilitators' *mandate* generally stems from a meeting of prospective members who decide to initiate a more formal networking process. The importance *not* to engage in the management of funds for network members, however convenient this may seem at a certain moment, is highlighted several times. It would cause the network to become a 'battlefield for funding' (Manrique et al., 1993).

A list or *directory* of member organizations is among the first concrete results most networks produce. It is generally motivated by the wish to facilitate networking without always involving the network secretariat. The organization and structure of networks may vary, but discussions generally concern membership, the role of the secretariat and regional or task-oriented subgroups, network facilitators, and decision-making procedures. It seems important to clearly define the composition, responsibilities and prerogatives of the network board, secretariat, and, if applicable, implementing bodies. The role of external agents in facilitating early stages of network development is mentioned frequently. Another important recurrent issue is the degree to which the secretariat, or network facilitation unit, should actively engage in implementing activities itself. Or whether formal rules should replace the largely un-written rules of network operation which generally reign during the early stages. Although it is difficult to make generalizations on such issues, experience seems to indicate that a convenient measure of formality is necessary, with a mandate for organizing members, staff, and other decision-making bodies. Manrique et al. (1993) observe for the CAME organization and structure: "... its functionality is based on the capacity to pass from individual actions of the members to integrated programming, and after the discussion and approval by the Assembly and Board of Directors, to implement the execution by the technical team and the staff of the NGOs with supervision and coordination of the Executive Committee". It seems part of the added value of networking to create the conditions for collective agency, a joint

management structure for planning, preparing, implementing and evaluating such tasks as have been agreed upon by the members.

A final point concerns resources for networking operations. Even if network activities are mostly delegated to member NGDOs, they still require time, energy, and money. The moment networks become more permanent, therefore, the issue of fund raising arises. Generally, during the early days by virtue of their own efforts participating members and particularly 'prime movers' liberate the energies, time, and funds from somewhere, mostly from within their own programme resources. Sponsors move in only when networking contours have been already worked out. This may often mean exchange and communication is limited to a number of NGDOs, or NGDO leaders, who are able to actually provide for facilities and funds themselves. Needless to say, this limits the participatory process during the early stages, while precisely at the beginning a widely participatory process seems to be mandatory.

6.6 Networking among NGDO: creating space for joint learning and innovation

What sets networks apart from other types of human organization? Or, better, what dimension does networking add to our repertoire of cooperative strategies? From the above analysis, I conclude it is particularly the emphasis on joint reflection and learning which sets successful networks apart. Networks, as it were, are 'learning organizations' by design. Networks are designed and operated to break through relative isolation and facilitate social learning processes amongst actors within the development arena, in order to jointly achieve a more comprehensive and innovative understanding of complex development situations. Yet, at the same time, networking aims at learning-in-practice. It does not separate learning and reflection from daily activities. Rather, it opens up a learning space *within* day-to-day activities for the members to systematically reflect upon and share experiences, knowledge and information.

The aim of networking, also, is not simply to learn from each other. NGDO and their leaders are motivated to net*work*, because it helps them to improve their organizations and field operations. If we take this as a point of departure, we may look at networks of NGDO as 'quality circles', designed and operated to help sustain and raise the quality of our work, outputs, and impact. In my view, this is exactly what networks ought to be. Networks are successful if they help improve performance. If they do not, networks collapse easily under the pressure of everyone's daily obligations. Such a contribution to performance can be of a temporary or a permanent nature. Not all networking activities become permanent or get institutionalized. Yet, if they do, it is because those investing in it intend the benefits from the network to continue.

The added value of networking: suggesting a standard

We are as yet far from being able to answer fully the many questions about the value added by networking. The study of networks amongst NGDOs, and their significance to the work they do, has just started. Hence, opinions vary widely and rather haphazardly between supporters and critics of networking. At the same time, many NGDOs and their staff dedicate a significant portion of their time to networking, and many more positive results have been reported than I have been able to report here. In order to be able to

answer this question more systematically, the first thing we ought to do is to set a standard. This is what all networks do for themselves, but no general one has evolved so far. Based upon the analysis presented in the first paragraphs of this chapter, I suggest the following criteria to be applicable:

(1) Networks are expected to contribute directly to upgrading the quality of the activities, outputs and impact of member NGDOs, by providing mutual support and services on the basis of a joint assessment of their needs.
(2) Networks are expected to facilitate a collective learning process amongst its members, contributing to 'upstreaming' NGDO analysis, perceptions, and policy development. This requires development, administration, and maintenance of a permanent and flexible communication infrastructure, the organization of regular meetings and workshops, social research, and the management of the network's 'development agenda'.
(3) Networks may be expected to contribute to 'upshifting' NGDO activity and directing it towards national and international audiences. This requires above all building strategic alliances with other NGDOs and networks for specific purposes. Where specific services are required, such as for editing and publication, for acquiring media time or press releases, or for lobbying, the existing capacities of network members, or other specialized agencies, where possible, are mobilized.
(4) Networks are expected to incur expenses for developing, administrating, and evaluating networking activities. These are the only 'overhead' costs related to network operations.

In my opinion, there is no reason why we should not try to be as rigorous in evaluating network performance as we are in evaluating NGDO performance in general. Every network has to specify its expected results and define indicators for measuring and verifying these. However, we will have to take into account the specific nature of networks as a space for social learning, reflection, and innovation, helping "... NGOs in the permanent reformulation and adaptation of their role with respect to the peasant population and the government institutions" (Manrique et al., 1993).

Networking: a strategy for improving inter-organizational innovativeness?

We have shown networking among non-governmental development organizations to be a promising strategy for creating successful alliances for innovating agricultural practices. Networks among NGDOs can be interpreted as emergent forms of social organization for innovation just as the institutional configurations described in the last chapter. In networks a shared 'theory of intervention' and a joint management structure emerge specifying tasks and responsibilities and mechanisms for establishing coordination and mutual adjustments. Experience underscores the importance of organization development for establishing and maintaining NGDO networks.

> ***Networking is organization development***
>
> "The proposal, performance and consolidation of a network should be understood as an organizational development process, which requires time, economic resources, some infrastructure and moreover specialized human resources ... (financial) costs and investments. ... The benefits of the network can not always be expressed in

> direct economic values. However it is absolutely necessary to try to value the benefits" (Manrique et al., 1993).

Could this conclusion about networking possibly lead to proposing an alternative approach to inter-institutional coordination? Do NGDO networks simply mirror the need for non-governmental organizations to build alliances for agricultural innovation, just like agricultural institutions did? Or do they reflect something else, some distinct characteristics which set these alliances apart? To briefly consider this question, let me start with reflecting upon the similarities and differences between 'NGDO networks' on the one hand, and 'institutional configurations' as we have discussed them earlier, on the other. We have argued that both can be interpreted as emergent forms of social organization for innovation. Also, once established both are structural arrangements: member organizations have agreed upon a division of tasks and ways to coordinate these among them. During the formative process, accommodations in views, objectives, methods
and resources allocations have been negotiated. Finally, in both cases we found that in successful institutional configurations as well as networks 'something close to' a joint management structure had been agreed upon, important decisions can be made collectively, a theory of intervention, stating objectives, tasks and responsibilities and ways to coordinate and mutually adjust these. As institutional configurations, networks can therefore be seen as a particular type of 'innovation configurations' as well.

However, a big difference seems to lie in the formative process, the purpose and quality standards that guide the creation of network configurations. Generally, government institutions are not allowed a phase of 'planned activism', of relatively open-minded collaboration during which individual organizations can learn to respect each other, to grow towards each other and 'test the waters of cooperation'. Moreover, government institutions do not normally obtain instructions and/or space to 'learn from each other', their mandates being strictly separate, mutually exclusive, embedded in legislation and hence, inflexible. It simply does not make sense to enter into open-minded collaboration and to seek accommodations and mutual adjustments, when the margins for such adjustments are thin as air or non-existent. This brings us to another important difference: NGDO decision-making, generally, is more decentralized than government decision-making is. Even when government (and non-government) agencies would locally achieve a design for a joint management structure, a functional arrangement to share tasks and responsibilities, there would be no guarantee that such a design would be acceptable to central government authorities.

In my view, the case studies indicate that networking efforts may indeed lead to configurations that demonstrate characteristics institutional configurations do not. The most important is that such networks are purposefully created as a space for joint learning and reflection. Mutual interdependence is a given, the main reason for joining up. Moreover, not only technical solutions but also intervention objectives are subject of debate. Active participation of all member organizations is not just a formal requirement, it is a working standard. The formative process is taken as an opportunity to build a strong foundation for future cooperation, not just as a period to renegotiate the institutional balance of power. And finally, networks not only recognize mutual interdependence, they nurture it by means of programmes for mutual support, services,

and by participating in the public debate as an articulated entity. As far as communication is concerned, it seems that in such networks the organizations and their staff purposefully engage in 'communication for innovation' as opposed to 'communication for control' (cf. par. 3.4). For these reasons, I suggest NGDO networks as the ones I studied in this chapter are fundamentally different from the institutional configurations I described in chapter 5. For government institutions to be able to participate in such networks, a number of fundamental requirements would have to be fulfilled.

Firstly, it became apparent from the cases that networking requires a number of social actors not only to be 'like-minded', in the sense that they adhere to the same general views and principles, but also to have autonomy to adjust their views and the process of intervention locally. Hierarchical power structures such as exist in most government bureaucracies seem to be at odds with this requirement. Central authorities at least would have to 'draw back' from controlling day-to-day operations in order to facilitate effective networking among government and other agencies. Secondly, whether government authorities would ever be willing to cede to decentralized government institutions the time and space to 'test the waters of cooperation' effectively, is another question. Current efficiency-oriented bureaucratic discourse seems to be at odds with open-ended proposals and what could be easily taken as 'costly free-wheeling at the expense of tax-payers'. Even if, as I have shown, weeding out such activities would probably increase the risk of reducing collective innovative performance dramatically.

6.7 Some preliminary conclusions

From this brief reflection, I draw three preliminary conclusions to be taken up in more detail further on. Firstly, the study of NGDO networking opens an interesting vista upon alternative strategies for creating successful inter-organizational alliances for agricultural innovation. Their actual impact upon agricultural performance needs to be studied further. Research may also shed light on the conditions which participating organizations would have to meet and the process they would have to go through, in order to successfully pursue such strategies. Secondly, both networks and institutional configurations may be understood as innovation configurations, emergent forms of social organization for innovation. The differences between the two stem from the purpose and principles which guide their establishment and operation, the nature of the social actors who participate, and the collective formative experience that leads to their emergence.

In potential, networks seem to be able to play a role as 'learning organizations' in which both the individual members and the network as a whole, improve their practices significantly over time. Perhaps we could think of networks as 'flexforms' of social organization for innovation, paraphrasing the term 'flexfirms' which has been suggested for innovative firms in management literature. However, additional research would have to answer such disturbing questions as whether network organizations, much like institutional configurations, are in danger of becoming rigid and unyielding as well and what elements or factors would trigger such a process.

Finally, the case studies add evidence to the suggestion that active network*ing*, i.e. relationship building and maintaining between relevant social actors, is an important

enabling factor for purposive and wide-spread innovation of agricultural practices among small-holders.

7. *The social organization of innovation: towards theory*

7.1 Introduction

This chapter is the result of my struggle to achieve a useful conceptualization of the social organization of innovation, the tentative end of what I called my 'exploratory path'. I will seek to combine the lessons from the cases with a number of relevant theoretical insights in order to formulate a response to research questions Q1 and Q2 (Box 1). My intention is to contribute to a more complete understanding of the social organization, not to present a comprehensive theory on it, even though I think we need one. My objective is to support meaningful discourse among practitioners and students and to stimulate further empirical research. Also, such an understanding will provide an important step ahead to achieve the second purpose of my study: the design of a practical methodology to enhance innovative performance.

This chapter is organized as follows. First, I present a central proposition I derive from my research: what social actors do in order to achieve innovation in practice can be conceptualized as *networking* (7.2). Then I will discuss and situate my approach in the light of three contemporary traditions of academic thought on innovation (7.3). Next, I will discuss the role of knowledge as a productive resource and propose Gardner's (1983) concept of human intellectual competence as the one most appropriate to link knowledge to innovation (7.4). In order to go beyond the individual to innovativeness as a social competence, I propose to conceptualize innovation as emerging from the interplay in-and-between social practices (7.5). This opens the way for suggesting how networking may be understood as a social practice aimed at innovation (7.6). Then, I return to the innovation process itself and propose it is to be looked at as an unending social process of inquiry (7.7). Governance in complex innovation theatres is the next main issue. I conclude that, given the appreciative character of social interaction for innovation, direction emerges from the social struggles, negotiations and accommodations among stakeholders (7.8). Then I answer my research questions suggesting that, as a result of active networking for innovation, over time forms of social organization emerge which demonstrate a momentum of their own and, as a result, become an enabling/constraining context for innovative social practice itself (7.9). How innovative performance is conditioned by the mental models we apply to organizing it, is briefly touched as well (7.10). Finally, I draw some conclusions as to the relevance of the ideas proposed in view of the objectives of this research (7.11).

7.2 Social actors in search of innovation

As I have shown in chapter 3 it is very hard to uphold the notion of a transfer of knowledge. Communication for innovation can certainly be seen as a purposive activity,

but all social actors involved in innovation theatres appear as both users and sources of relevant knowledge and information at the same time. The clue is in the 'relevant'. I have shown that farmers in Asten recognized many sources of relevant information covering several different types of information and several types of information use (tables 3 and 4). But not every source of information is always equally relevant to the farmer. The acquisition and use of knowledge and information is bound to purpose, context and time. For each type of information and each type of use, different sources may be attributed relevance. For the advisers the same applies. Their professional portfolios mirror a selection and use of sources which, on the one hand, extends beyond their mandate as 'transfer agents' of technical/scientific knowledge but, on the other, reflects a certain degree of 'standardization' imposed by their agency. From the case study evidence I may propose that communication for innovation is intrinsically woven into the daily practices of the social actors involved. Also, I suggest that multiple sources of relevant knowledge and information are to be recognized. Hence, as part of their daily practices, the social actors develop professional strategies to access those sources if and when judged necessary. To reduce our study to the transfer of one type of knowledge or information from one type of source to one type of user for one type of use, from the point of view of the social organization of innovation, would be equivalent to studying one thread out of a sophisticated piece of embroidery. I will have to look for a more comprehensive conceptualization of what it is that social actors do in order to achieve wide-spread innovation of agricultural practices.

A second issue from the case studies is that innovation is a social rather than solely an individual process. Each of its participants, consciously or not, contributes a specific piece to the 'jig-saw puzzle' called agricultural innovation. In it multiple and diverse communicative interactions play a decisive role. Not only do such interactions emerge spontaneously, to a certain degree they are managed and/or facilitated. The intentional design and implementation of strategic 'articulations' is brought forward as a way in which organizations create the opportunities for their collaborators to engage in a process of step-wise, task-oriented integration of different strands of relevant knowledge and information in order to gain new insights and to create new messages, new policies and new technologies. The complex communication networks which emerge from such strategies as well as from more spontaneous interactions amongst actors are to be taken as 'value-added' networks: they help articulate different strands of knowledge and information into new lines of thought, action and reflection.

A third issue from the case studies is that communication is to be understood as only one aspect of the social relationships which develop between farmers, veterinary doctors, district extension managers, farm adviser, technical specialists and other social actors in complex innovation theatres. Their professional communication strategies form a intrinsic part of their daily practices. Obviously, a very important part as communication for innovation is (part of) their job. But in practice, personal interests and concerns as well as social, economical and cultural factors play a role in explaining their communication patterns. This becomes even more obvious when we look at the interactions between organizations and institutions. The network articulations and institutional configurations which emerge reflect the use of power and influence for coordination and coalition building, rather than solely the use of communicative interaction for the transfer of knowledge and information (chapters 4,5,6).

I conclude that in order to study the social organization of innovation, we will have to develop a conceptualization which accounts for the multiple, diffuse and social character of innovation in practice. What social actors are doing continuously, either spontaneously or in a more organized way or both, is to build relationships with each other in order to create opportunities for joint learning, for increasing their understanding and for improving upon current practices. Consistent with my findings in chapter six, this we may label *networking*. The understanding of such purposive relationship-managing for learning is, it seems to me, a central clue to understanding the social organization of innovation. Besides, I have shown that what is commonly held to be a process of knowledge transfer, might better be understood as a continuous process of step-wise integration of knowledge, information, ideas and experiences by means of temporary, task-oriented articulations between social actors. The participants contribute ideas and insights gained within their own environment, contributing as such to an encounter of ideas and experiences from different practices. The networks articulated by farmers and advisers appear as complex, multiple networks of relationships which facilitate the integration of knowledge and information of different types, for different purposes.

7.3 Innovation theory revisited

How does such a networking approach relate to contemporary traditions of academic thought on innovation? Generally, in knowledge systems thinking the definition of processes of innovation is associated with the use of 'diffusion of innovations theory' (cf. Beal et al., 1986). This tradition was articulated in the sixties and early seventies by Rogers and others. Within it an innovation is defined as "an idea, practice, or object perceived as new by an individual. It matters little, so far as human behaviour is concerned, whether or not an idea is 'objectively' new ... If the idea seems new to the individual, it is an innovation" (Rogers & Shoemaker, 1971: 19). Later on, a distinction was made between an 'innovation' as an idea, and a 'technology' as a design for instrumental action (Rogers, 1986: 39). Social change was conceptualized as a process including three sequential stages: invention, diffusion and consequences (Rogers & Shoemaker, 1971: 38). Technical change in agriculture was consequently seen as caused by the adoption of technical innovations by agricultural producers. And the source of such innovations was taken to be scientific research and development. Within this tradition, emphasis is put on studying the adoption process and the search for attributes of innovations which may help explain their effective diffusion and consequences for social and/or industrial change. This approach is consistent with the 'linear' or transfer of technology (TOT) model of innovation thinking. The limitations of such an approach have become increasingly clear (Kline and Rosenberg, 1986; Chambers & Ghildyal, 1985; Röling, 1991).

Contemporary industrial innovation researchers have developed much more sophisticated theoretical models to study innovation. Roobeek presents an 'integrated innovation concept' stressing interactions in wide-spread 'technology webs'. Around key technologies webs of innovations and new applications develop and spread in widely different directions (Roobeek, 1988: 50). However, because of the emphasis on the result of the innovation process, the technology, the basic issues remain unaffected. While developing a much more comprehensive conceptualization, Roobeek (1988: 40) continues to describe the innovation process as "..the process from invention to diffusion..". The same can be

said about Kline and Rosenberg (1986) who emphasize the interplay between scientific developments and commercial or industrial activities. In their 'chain-linked model of commercial innovation' science does not play a dominant role. It interacts with industry to solve certain problems which are encountered while designing an innovation from a market oriented perspective. In the design process the interpretation of the market potential directs an interactive process of invention, initial design, testing, redesign, production and distribution of the innovation.

A second tradition is the 'induced innovation' school of thought (Hayami & Ruttan, 1985: 88): "Farmers are induced, by shifts in relative prices, to search for technical alternatives that save the increasingly scarce factors of production." As they are careful to point out, technical change is not wholly of an induced character. Farmers, scientists and administrators play active roles, responding to exogenous (supply) and endogenous (demand) factors and taking part in the general progress of science and technology. As a consequence, technical change is defined as: ".. any change in production coefficients resulting from the purposeful resource-using activity directed to the development of new knowledge embodied in designs, materials, or organizations" (Hayami & Ruttan, 1985: 86). The induced innovation school has contributed particularly to making explicit the enabling and/or constraining economical conditions for innovation. It calls attention to the fact that innovation processes always take place within a particular social, economic and ecological context. The interpretation of these contexts, in terms of constraints and opportunities for innovation, is an important issue for both researchers and practitioners of innovation. However, studies within this school of thought have focused on macro-level economic issues mostly, with little attention for micro-level or social issues.

A third, relatively recent school of thought I might label 'the networking tradition'. Wissema & Euser (1988), Moss-Kanter (1989) emphasize the importance of inter-company cooperation for creating opportunities for innovation. Pooling, Allying and Linking ("...becoming PALs..." according to Moss-Kanter) across companies, is advocated in order to facilitate innovation and remain competitive. Within the networking tradition, two-way communication and support, inter-dependencies, synergies and complementarities amongst participating actors are emphasized. Innovation is taken to emerge from joint activities between companies who recognize 'win-win' situations (Wissema & Euser, 1988), situations in which cooperation can bring advantage to both sides. This is not to be confused with an emphasis on 'consensus building'. Articulating a joint performance does not necessarily require a broad consensus but rather an explicitly shared understanding of what each of the partners may reasonably expect to gain from the partnership. In agriculture the networking tradition is gaining a lot of momentum, particularly among those concerned with sustainable and/or low-external-input agricultural development. Box (1989, 1990) studied knowledge networks among small farmers. Participatory technology development (Chambers & Jiggins, 1987; Jiggins and de Zeeuw, 1992) stresses partnerships between farmers, researchers and extensionists to develop adequate farm technologies for sustainable development.

The conclusions I have drawn from my case studies situate me close to the third tradition. However, while it is the more practical, it is also the less developed conceptually. Moreover, I think that many of the elements identified within the scope of the other traditions should not be discarded but integrated in a more comprehensive

conceptualization of innovation as a social process. Clearly, as a general theoretical approach to guide an investigation of the social organization of innovation, I discard the linear model. The linear model refers to just one out of many possible structural arrangements for innovation. It coincides with one of the extreme ideal types I proposed: the research and development driven basic configuration. The interactions I have studied point at a highly diversified universe of social actors, which each specialize on a distinct type of knowledge and information related practices. I therefore adopt a view similar to Kline and Rosenberg (1986) who propose that science and technology do not necessarily play a dominant role in innovation processes. They suggest, social actors who control market channels, such as processing plants and retail chains, play an active role as well.

My studies confirm that social actors at the scientific and technological frontiers as well as those who control marketing channels are among the leaders in innovation theatre. But they are not the only ones. The chain-linked model, in fact, offers a combination of two structural ideal types only: the industry driven and the R&D driven basic configurations. Therefore, it tends to underrate the relevance of those social actors who control financial resources and political agendas, as well as those who actually operate farms. From my inquiries it becomes apparent that these latter actors hold important keys to innovation in complex theatres too. And besides, all of these struggle to enforce their views and strategies at the same time. As a result, generally not a linear or bifocal structural arrangement emerges but a multiple one in which many social actors play their roles and strategize to gain leadership at the same time. In other words, the linear and chain-link models represent particular arrangements that have emerged as a result of negotiations between certain dominant social actors at a certain point in time. They represent a particular view of the relevance of technology and market as driving forces for innovation, not a general model to support a balanced inquiry into the social organization of innovation. Such a model would have to enable us to study the social interaction of all, not just some of the important social actors relevant to directing the course of agricultural innovation.

Therefore I propose to develop further the *networking approach*. Such an approach, emphasizing social relationship building and managing for innovation, does not 'a priori' exclude any social actor from influencing the course of innovation. It concentrates upon all social interactions relevant to agricultural innovation at a particular point in time within a specific social, economical and ecological context. It assumes that in any given situation a multiplicity of social actors develop and manage interactive relationships in order to improve their practices and develop new ones. The reason that these actors engage in such relationships is perceived interdependence: each is perceived as holding some of the keys to the others' projects. What is relevant is to find out which of these is more dominant in view of the direction the innovation process takes: policy makers know about and work on the establishment of policies and regulations; industrial actors interpret the market, finance R&D programmes and develop marketable products; (potential) users of new technologies judge its (potential) added value to their own practices; research institutes may offer technological alternatives, or support particular propositions or open new alleys of inquiry; financial donors may choose to invest in certain proposals more than in others; and other social actors may exert an influence through opting in favour of certain solutions, in view of their particular concerns as consumers, wild life activists, ecologists, tourism operators, and the like. The study of the social organization of

innovation can then be initiated by asking which of the potentially relevant social actors actually succeed in directing the course of innovation through its interaction with others, and how this is accomplished.

In addition, I coincide with the 'induced innovation' tradition, that an innovation can be usefully looked at as a shift in (agricultural) practice. But I do not believe changes in factor prices are the only reasons why farmers change their ways. Sometimes they are not even the main reason. The 'quality' of the means of production at the farmers' disposal may change in many ways not expressed in its (shadow) price: soil erosion may deteriorate the quality of the farmer's plots; a lack of transport may induce inaccessibility of credit whereas other conditions, including its interest rate, remain the same; etc. At the same time farmers may decide, as a result of reasoning and/or experimentation, that different ways of doing things provide better results; or they may simply change their minds about what is 'better'. In other words, innovation at the farm level is a process of modifying (agricultural) practices, not directly induced by market forces, ecological deterioration, financial constraints, social relationships but mediated by *how farmers perceive and learn to anticipate upon or adapt to* such phenomena as are relevant to their operations.

However, although I agree with Box (1990: 4) that the "...locus of change lies primarily within the production conditions of the cultivator", my case studies point at the fact that many social actors, consciously or not, contribute a specific piece to the 'puzzle' of agricultural innovation. The question is no longer whether farmers innovate or not. It should be rephrased in order to ask whether all actors potentially relevant to agricultural innovation are innovative and interactive enough. The keys to wide-spread innovation generally are not held by one or two but by a number of social actors engaged in different practices. In most cases, each of these practices are to suffer modifications for an innovation to take place. An example is the introduction of chemical fertilizer (see below). Innovativeness can no longer be seen as an individual competence, or even as the sum of a number of individual competencies, it must be seen as a *social competence* shared among social actors who are part of a (large) number of relevant practices.

> ***The introduction of chemical fertilizer required the transformation of many practices, not only farming practice.***
> The world-wide introduction of chemical fertilizers in agriculture over the last five decades has shown beyond any reasonable doubt that in order to achieve success considerable transformations were necessary in a large variety of practices which went far beyond farmers learning how to buy and throw some handfuls of chemicals. It depended upon enormous shifts in agricultural, commercial, industrial, financial and political practices. Infra-structural and marketing arrangements have to be made to achieve a reliable and timely delivery of fertilizer. This might imply dramatic shifts in 'delivery practices' when the supplied volume of fertilizer is limited and/or subsidies are involved. Also the market is to ready itself to channel the increased production volume. Generally, seasonal credits have to accompany the use of fertilizer by smaller producers. Banking practices have to be adapted to that. The local use of fertilizers has to correspond to local conditions and adapted recommendations, so national research programmes have to be financed, or even installed, to produce such recommendations. Sometimes, farmers have to learn to

> adjust long-lasting beliefs that guided them through difficult times for ages, such as the "law of the limited good" (Foster, 1965) explaining structural increases in the production of one farmer as causing the suffering and decreased production by others. As a consequence enormous investments in extension are required. Moreover, politicians have to accommodate to the fact that as a result of introducing fertilizer use, a large part of the country's foreign exchange has to be dedicated to buying it on the international market, even if the eventual agricultural produce is not (yet) intended for export. The list of transformations in practices could be extended almost indefinitely ..... technical innovations at the farm level are a necessary yet not a sufficient condition for wide-spread innovation processes to occur.

To construct such a social competence, to effectively link up the efforts of such social actors as are considered relevant to the achievement of particular innovation processes, can be seen as the general purpose of networking for innovation. Innovation processes may include the design and development of new products or services, the conception of new policies, regulations and/or intervention strategies, or the design of new research, financing or marketing strategies, or, as is generally the case, a combination of several of these. It is those social actors interested in a particular type of innovation who themselves choose their 'PALS', choose to participate in existing networks or build new ones and who, through their management of such relationships, may either enhance or suffocate the chances for particular innovation processes to occur. The social organization of innovation can be understood to include the building of strategic alliances between actors who intend to enhance a particular type of agricultural development, perhaps even to the expense of others. Consequently, innovative performance, among other things, may depend upon the adequacy and quality of networking efforts among social actors who perceive each other as relevant to their respective projects. A huge question mark looms behind such a definition of networking and innovative performance: who decides, when and how, who the 'relevant' actors and practices are? In 7.5 and later paragraphs I will return to this issue. First, let me explore further the relationship between knowledge and innovation.

7.4 Knowledge, knowing and innovation

The case studies confirm the central importance of *knowledge* as one of the productive resources available to farmers to manage and develop their operations. I have shown in chapter three that farmers as well as advisers develop professional strategies to deal with information, to evaluate their experiences and to learn from them. The case studies show both individual strategizing and socially constructed standards for the use of knowledge and information. Advisers develop individual strategies to deal with the variety of sources at their disposal to acquire information. Individual specialisations evolve. Also, professional standards appear in the way farmers and advisers select and use information. Information from different sources is used for different purposes. It demonstrates general rules for information management: if you want to know the price of an article, ask the supplier not the extensionist; for operational information refer to farm visitors; for technical information refer to the farm journal and the local experimental station first; etc (ch 3, table 3). On the other hand, the 'main menu' (ch. 3, fig. 3) reflects specific rules as a result of education and training: make sure you get the problem clear first; calculate

the extent of the problem for the farmer; compare alternative solutions,etc.; but also informal rules from experience: do not rely on Government or technical information only; select those pieces of documentary information which are brief and to the point, and which you can leave with the farmer afterwards (ch. 3).

I have also shown that the 'knowledge' of farmers and advisers does not refer to technical or scientific knowledge alone. Farmers were very well capable of distinguishing between, for example, strategic, operational, technical, policy and marketing information, attribute reliability for each to different sources and, consequently, show evidence of a different information acquisition strategy for each of these. In other words, farmers make a distinction between social actors, amongst other things, on the basis of the type of knowledge they seem to command. To become relevant to farmers, an actor does not have to be knowledgeable only in a technical sense. In practice, technical and/or scientific knowledge is just taken as a particular attribute of some of the social actors participating in complex agricultural innovation theatres. Such actors are not seen as *the* source of knowledge, but as *one of them*. Obviously, various bodies of knowledge exist relevant to particular contexts (Box, 1990: 3).

A third point apparent from the case studies is that knowledge acquisition by farmers and advisers is intrinsically woven into their daily practice. The case study amongst advisers showed, for example, how individual portfolios reflected different personal interests as well as professional histories. What issues advisers become most acquainted with also depends upon the situation in their working area and the questions farmers put to them. Knowledge can therefore not be severed from actual practices.

Unfortunately, much of the literature commonly taken to belong to the tradition of 'knowledge systems' thinking' is intentionally vague on its definition of 'knowledge' (Havelock, 1986: 13). The 'knowledge utilization perspective' seems to refer to knowledge as something which can be transferred or transported (Havelock, 1986: 21). Moreover, most attention has been given to the generation, exchange and utilization of scientific and technical knowledge only. This has contributed to a lack of systematic attention for indigenous or local knowledge. Röling (1988: 186), however, explicitly states knowledge to be an attribute of the mind which cannot be transferred. The same author refers to the use of the concept of 'local knowledge' as "... shared and accumulated knowledge vis-a-vis a collective experience in a shared environment", thereby implying its social character (Röling, 1988: 186).

From an actor-oriented perspective, Long stresses the social and dynamic nature of knowledge: "Knowledge processes are embedded in social processes that imply aspects of power, authority and legitimation; and they are just as likely to reflect and contribute to the conflict between social groups as they are to lead to the establishment of common perceptions and interests" (Long, 1992: 27). Knowledge, he continues, is not simply something that is possessed and accumulated: it emerges out of processes of social interaction and should be looked at relationally. Arce & Long (1987: 5) suggest knowledge can be defined as being "...constituted by the ways in which individual members of a society or social group categorize, code, process and impute meaning to their experiences". A body of knowledge is therefore not made up of facts, but rather by the ideas and values which govern the imputation of meaning (Box, 1990: 2).

The practical dimension of knowing has been emphasized by different authors. For Maturana and Varela (1984: 15) to know is to act effectively. Knowledge includes the ideas, concepts, routines and skills people acquire over time to support their livelihood. And the only way to study it is to observe and evaluate (certain aspects of) people's behaviour. Or as Gremmen (1993: 77) argues: "The competence is in the performance: the relation between standards and action is internal." Besides, for most authors *communication* plays an important role as a social process which involves constructing, anticipating and attributing meaning to experiences and to information about events and ideas. The role of language in facilitating and/or impairing the process of knowing is captured intriguingly by Gremmen (1993: 81): "The study of human knowledge as a whole is distorted by the focus upon statements, when it takes knowledge to be the sum (or product) of true statements. Hence it construes the limits of human knowledge as coinciding with the limits of language. The alternative is a focus on concepts, which takes human knowledge to be the human capacity for using concepts of a language, for characterizing (categorizing) the world when and as it is humanly done, and hence construes the limits of human knowledge as coinciding with the limits of its concepts (in some historical period)."

I conclude that, in order to contribute to the study of the social organization of innovation, a conceptualization of knowledge would have to address at least four dimensions: firstly, knowledge can be seen as *cognition*, a human faculty to perceive or conceive; secondly, knowledge is *practical*, intrinsically woven into daily practices of an individual or group; thirdly, knowledge can be perceived as a property of the *individual*, enabling him or her to infer from experience, observation and/or reasoning; finally, knowledge is *socially* constructed, embedded as it is in the social dynamics of an organization, a community or a group. Perhaps, I should be talking of *knowing* rather than knowledge. Knowing emphasizes the dynamic unity of learning and doing rather than the static aspects of knowledge as statements about the world and rules and recipes for acting in it. This would also help to highlight the problem-oriented nature of communication for innovation. As the cases underscore, social actors to a large degree behave purposefully or even professionally in order to enhance innovation in agriculture, taking on the challenges as they present themselves along the way. To emphasize the combined social, individual, cognitive and practical character of knowledge in my study, I found knowledge can be usefully thought of as a *human intellectual competence*:

> "To my mind, a human intellectual competence must entail a set of skills of problem solving - enabling the individual *to resolve genuine problems or difficulties* that he or she encounters and, when appropriate, to create an effective product- and must also entail the potential for *finding or creating problems* - thereby laying the groundwork for the acquisition of new knowledge. These prerequisites represent my effort to focus on those intellectual strengths that prove of some importance within a cultural context. At the same time, I recognize that the ideal of what is valued will differ markedly, sometimes even radically, across human cultures, within the creation of new products or posing of new questions being of relatively little importance in some settings" (Gardner, 1983: 60-61).

This way, what people know and how they go about learning is intrinsically woven into their social life. Innovation emerges as a result of social efforts to come to grips with the demands of the social and physical environments individuals and groups are immersed in. In complex theatres of agricultural innovation, this does not only apply to farmers, it applies to extensionists, environmental activists, researchers, policy makers, wild life protectors, agro-industrialists and input suppliers as well. The definition points at still another dimension of knowing: the ability of human beings to perceive and/or create problems in practical situations. This has important consequences for our thinking on networking to which we will return later (7.6).

7.5 From transfer to interplay between social practices

I have proposed to look at innovation as a process emerging from the multiple interactions between social actors from different relevant practices. Yet I have not specified what I meant by 'practices'. I have used the word in its general, intuitive meaning. Still, my conclusion that innovation processes are closely woven into the daily practices of the social actors warrants a further look. During my case studies, however, I just looked closely at knowledge and information related practices. Therefore, to analyze in detail the relationship between these and all the other practices which make up the competent performance of, for example, farmers or policy makers goes beyond the scope of this book. I will just limit myself to sketching the contours of a promising new area of inquiry which places these communicative practices into a broader social perspective.

Gremmen (1993) studies the philosophical and practical implication of modern thought with respect to knowledge, learning and practice. His analysis allows us to look at agriculture as a 'technical practice': "In a technical practice large series of competent performances are planned and executed in which the course of certain socio-natural processes is steered in a desired direction". Just as learning is a social phenomenon, developing a technical practice is. Farmers through competent performance position themselves in relation to each other. Social relationships evolve on the basis of communicative interaction related to performance. To be a 'good practitioner' requires recognition as such by fellow farmers and others relevant to the practice. But a practice is not a collection of habits. On the contrary, as series of performances are created by practitioners, each one may be modified by its predecessors (Gremmen, 1993: 79). The ongoing competent performance mirrors the interwoven learning processes of its different participants, while both the natural *and* the social world are reconstructed (Gremmen, 1993: 106). Reflection-in-action is the way in which technical practices evolve: it is indigenous rationalization" (Gremmen, 1993: 115). Looked at it this way, innovation may be considered essentially a social learning process, embedded and intrinsically interwoven with the ongoing evolvement of agricultural practice.

But can such a complex social learning process be considered to respond to purpose, as we claimed innovation does? Do actors indeed organize themselves for learning? Can such learning be taken to emerge as a result of purposive activity at all? I find in the continuous struggle for competence in practice a powerful argument to support such a proposition. In practices, standards of competence are upheld which stimulate the participants to improve their practices or, if the standards prove inadequate, to change

them. However, I repeat my earlier warning against assuming a simple, straight-forward causal relationship between intentions and effects in the case of innovation in agriculture. I will not even try to picture innovation processes as the outcome of solely *intentional* actions. 'Purposive' I understand in a more general sense as 'showing purpose and determination' (Hornby, 1974: 680) rather than aiming at a specific object or result defined in advance.

I am left with another important question. I have argued that agricultural innovation is not carried by farmers alone. Through an ongoing process of division of labour within the agricultural practice, distinct competent performances have emerged - each involving standards of both competence and performance - which may be understood as practices in their own right: research, trade, extension, policy making, education, industrial processing, etc. Although the degree of interdependence may differ from one situation to another, agricultural innovation may be looked at as a result of the loosely articulated competent performances of all of these. Gremmen's (1993: 159) 'interplay model' illustrates some of the fundamental contours of an alternative conceptualization slowly emerging from the discussions.

> ***The main characteristics of the interplay model according to Gremmen:***
> The basic idea behind the interplay model is that practices evolve autonomously in interaction with each other. Each can be analyzed as a competent performance, constrained by its own defining and experience rules. These rules, far from being static, are continuously (re)created in social interaction by the participants in a practice. Knowing as an activity not knowledge is primary. "The central claim of the interplay model is that improvement is primarily an internal achievement of practices themselves. External influences can speed up or slow down the indigenous improvement of a practice" (Gremmen, 1993: 159) External influences on a practice are the result of interaction between practices. These are seldom a one-way influence. As a result innovation in practices derives from the interaction in-and-between practices not from the discoveries of one single practice, for example science.

The interplay model implies that each practice creates its own relevant knowledge through reflection-in-action. "Science is often, and mistakenly, seen as the ideal way of advancing knowledge, while in fact its progress is predicated on the practical possibility to create closed systems" (Gremmen, 1993: 116). However, practices are not developing as a result of internal dynamics alone: some develop weak, two-sided interactions which may stimulate and at the same time constrain indigenous developments at both ends. Different practices such as science and technology may be seen as "... enmeshed in a symbiotic relationship....Science as one context of inventive activity (...), may readily become conditioned by criteria from the technology, the other context, and vice versa" (Gremmen, 1993: 140).

The interplay model acknowledges explicitly the diversity of types of knowing relevant to agricultural innovation in practice; and it also helps us to understand the relative autonomy of knowledge processes within each of the practices relevant to agricultural development. Besides, recognizing the interplay between different practices without assuming the necessary superiority of one over the others, opens the way for studying the

social organization of innovation as a multi-facetted, complex process of interactions between a variety of actors, each engaged in competent performance as relevant practitioners. Such a perspective may allow us to take the specific knowledge of farmers, extensionists, traders, industrialists, researchers, policy-makers, etc. more seriously.

While concentrating my argument on 'practices', I was tempted to label all social actors in agricultural theatres as 'practitioners'. From the very beginning of my research I found that such a delimitation has a cost. As Gremmen points out the concept of a practitioner is an alternative to the concept of an individual actor in standard theories of social science. "Practitioners...cannot practice on their own, and what they are and what they do cannot be isolated from the practice in which they participate. It is their competent performance in the practice that makes them into practitioners... when they lack the competence (or are labelled as lacking it), they will be defined as not belonging: "He is not a real doctor or engineer," is the phrase then (Gremmen, 1993: 107). As he indicates, a complication exists in using such a definition in a consequent manner: participants of a practice include both practitioners and clients or beneficiaries. The difference between them is the result of professionalization strategies and can be contested (Gremmen, 1993: 107). Focusing solely on 'practitioners' may guide my investigation to overemphasize 'professional' practices to the detriment of 'lay' ones. Apart from this, in a society in which it can be convincingly argued that 'lay probing' is more and more crucial to solving problems (Lindblom, 1990) such a distinction would definitely mean a step backwards.

Therefore, I suggest to avoid a distinction between 'professional' and 'lay' and broaden the scope of the concept 'practices' to accommodate both. Any practice can be looked upon as a 'social practice' in the sense that social actors, professional or lay, relate to each other to (socially) define and reinforce rules of competent performance. A social practice becomes a discernible set of social actors, who define and uphold their performance through (some form of) social interaction. When social actors through a shared history of performance have developed behaviour which is to a certain degree rule-governed such an approach seems applicable. Both definition and experience rules must be recognizable to the observer and recognized by the actors. With this, the concept of 'social actor' can be taken as the broader term referring to participants in a 'social practice', while 'practitioner' remains the narrower term referring to participants in a particular brand of social practices called 'technical practices'.

There exists ample literature in support of looking at innovation as emerging from interplay between social practices, rather than limiting ourselves to technical ones. Many authors (ex. Richards, 1985; Röling, 1988; Chambers, 1989) emphasize farmers' or indigenous knowledge is a most under-utilized resource for agricultural development. But its utilization is presenting serious problems: farmers' local practices respond to different sets of rules than researchers' practices do, so that mutual understanding, for example in recognizing the role of spirituality in farming, is complicated. Millar (1992: 61) refers to the "... 'grey areas' of farmers experimental logic and strategies". To understand the social organization of innovation in rural areas it seems extremely rewarding to study the definition and experience rules governing indigenous farming practices and the way experimentation leads to indigenous innovation. Rap (1992) and Stolzenbach (1992) have presented preliminary evidence on the importance of such studies. Brouwer (1993) showed how amongst Adja farmers in Benin constant attention to possible improvements

is evident and how sophisticated procedures are used to share experimental results. Clearly, indigenous farmers are to be integrated in our models as 'social practitioners' in their own right.

Bourgeois (1990) provides us with another example. The difficulties in linking or even merging research and extension activities are often rooted in their mandates and working procedures and hence, in the rules which govern their competent performance as practices: "National extension services, with their broad mandate to reach all farmers in all regions of a country, often serve as a tool for implementing government policies. As a result, they tend to be hierarchical, highly centralized in terms of decision-making, and heavily regulated and standardized in terms of tasks, skills, and procedures. In contrast, national research, which is an open-ended process of scientific inquiry, is characterized by a 'flatter' structure, greater delegation of authority, and less standardization" (cited from: Merrill-Sands & Kaimowitz, 1989: 37).

I conclude that innovation can be conceptualized as emerging from the interplay in-and-between social practices. Social actors each belonging to one or several social practices, in their daily struggle to come to grips with the demands of their socio-natural environment, build and maintain interactive relationships with each other in order to increase their chances for improvement. This 'networking' is discussed in more detail in the following paragraph.

7.6 Networking as innovative social practice

I have shown that *networking for innovation* can be understood as a process in which social actors search, establish and manage interactive relationships with others from relevant practices. Relevant practices may include their own as well as others which by some standard they judge as being significant. This 'standard' is some shared idea or theory about what type of agricultural development is desirable, and who is to be involved in it to make it work. Rather than aiming at 'transferring messages or technologies' these efforts are meant to *create opportunities for joint learning and reflection.* Yet, as we saw in chapter 4, 5 and 6, networking is more than communicative interaction: it generally covers a wide range of transactions concerning products and services as well. Sometimes, but not always, a commitment to joint activities or cooperation is part of the networking relationships. I will illustrate these points briefly from the case studies.

> ***Networking-between-practices:***
> Farmers develop interactive relationships with such people as they judge most relevant to their farming operations. Not all relationships are the same however. With what I have called 'farm visitors' (veterinary doctors, advisers from fodder companies, health inspectors, farm advisers, etc.) they develop interpersonal relationships. These are tied to a service or product yet with time develop into a multi-dimensional social relationship. The value each of the practitioners receives from the interaction is in the first place practical: the farmer obtains an advice, service or product, the visitor a (financial) reward. Yet, at the same time other, less material exchanges take place: in order to be useful the visitors have to help the farmers clarify their questions and/or problems; this, in turn, improves the visitors'

knowledge of the farm and provides them with ideas to improve their performance. The 'main menu' (covering the exchanges between advisers and farmers about the on-farm manure storage) clearly illustrates the different issues tackled between the adviser and the farmer. The documents carried by the adviser illustrate that these do not expect to contribute on every possible issue. Also, it is clear that, to some of the issues the adviser holds the 'key', i,e, the knowledge and information relevant to understanding it better, while to other issues the farmer or, possibly, other actors posses more relevant knowledge and information. It is the encounter between two persons of different practices relevant to agriculture which creates an opportunity for both to enrich their understanding of the issues involved.

Quite a different relationship farmers develop with information services, farm journals and mass media, mostly. These services do not send visitors to the farm regularly, so no interpersonal relationship evolves. Their information is of a client-oriented nature but not custom-made to an individual client. Farmers consider the farm journals to play a very important role in providing them with a general 'picture' of what is going on in the sector. The farm journals use materials from different sources to be able to fulfil this role. Their editors and journalists include and/or produce materials about policy trends, technical and market developments. They network actively with people in policy-making, research and marketing, and other practices they deem relevant. Often, they make direct use of materials produced by companies, researchers or extensionists. Their audience does not comprise farmers only. About one fifth of the documents the advisers carried originated from dailies or journals. And it was particularly this type of information which contributed to the personalized strategies of the advisers (table 3.1). In the farm journals, information on experiences, events and ideas from different sector-related practices is combined and/or grouped together. Therefore they provide what I have labelled a 'carrier wave' to innovation in the sector.

The reasons why social actors engage in building social relationships are quite straightforward. Most are practical, directly related to the maintenance of their competent performance as practitioners. In order to be a 'good' farmer a dairy producer needs healthy cows, and hence, from time to time a veterinary doctor. At the same time, when ideas change about what a 'good' farmer is, the role of the veterinary will have to change as well. This points into the same direction as the mutual interdependence we have noticed among some institutions engaged in agricultural development: competent performance of one is intrinsically linked to competent performance of the other. If, however they could be successful without the other, networking would stop. I conclude that with regard to innovation interdependence is a matter of need as well as perception. A 'theory of intervention' may call for cooperation between farmers and advisers, between research and extension, or between different NGDOs. However, equally conceivable is constructing a theory which does not. This is illustrated by DRI's initial negligence of research (Ch. 4,5). It is also apparent in the different 'models' which have been used to study innovation processes treated in paragraph 7.3.

Following my conclusions in chapter 6, I propose to speak of 'networking for innovation' *only if* each of the following three appreciations has been recognized by those actors involved: (1) the existence of a relative but critical deprivation of experiences, knowledge

and/or information which hampers individual competent performance; (2) the need to jointly gain a more comprehensive and more effective understanding of a common problem or concern; (3) the wish to work out alternative development proposals and, possibly, argue these in view of alternative proposals by other actors. All three reflect a genuine concern to improve the quality and impact of individual and/or joint performances. Networking for innovation is done to break through relative isolation and to facilitate social learning processes amongst actors engaged in different social practices. When such a general motive is lacking, it is hard to imagine purposive innovation activities to take place at all. Individual motives of social actors to network may be highly diverse, such as to earn more money, to provide a better government service, to rescue the forest areas, to prevent environmental deterioration or to promote sector-wide competitiveness.

Consequently, the practical results of networking efforts are extremely diverse too. They may range from the simple exchange of documents to the organization of seminars to providing technical services to members to establishing a joint label for marketing a range of quality products. In chapter 6 I have suggested that network activities may be categorized in four types: learning-through-joint-reflection, services, advocacy and network management of facilitation. I propose the support or services may be taken as the practical foundation upon which the learning processes are grounded. Or, as Manrique and Bueno de Mesquita (1993, cited ch 6 p 12) put it: "The immediate needs arising from the field work of each of the institutions, are the basis and reason for being a network". Networking is what it says it is: *working*. Its link to the daily practice of each of the participants is strong and in line with my conclusions on the practical nature of knowing (7.4). This means that the range of practical results is unlimited. It depends upon the assessment of their needs by the network members, and upon their views and decisions as to what is most important at a certain point in time. In other words, it depends upon the *theory of intervention* they subscribe to and the *mission* they expect their networking to accomplish.

However, I have argued that what sets networking apart is the space it creates for *joint learning and innovation*. Therefore, the ways in which network members construct opportunities to enhance their learning are to become central to my analysis. In chapter 6, I identified diagnosis, exchange visits, workshops, working groups as mechanisms to enable network members to share experiences and learn. In chapter 4, I recognized the role of on-farm trials, interdisciplinary task groups and subject-matter specialists at liaison positions. Chapter 3 highlighted the role of communication networks, articulated with the use of interpersonal and mass media. Rap (1992) pointed at the fact that, particularly when farmers are involved, learning settings may not only be discursive, by means of reasoning and language acts. Learning by means of experimenting, doing and observing are to be included as well. For obvious reasons, *communication practices* are playing a central role in facilitating such learning processes. Networking can only be effective if network members have acquired the skills needed to effectively communicate with each other, when communication infrastructure and information services are available and when an approach is articulated in order to create space for and facilitate joint learning. Actual innovation, I may suggest, is contingent upon the quality of the communication and learning processes provoked by the networking efforts of social actors belonging to relevant social practices.

The appreciative nature of networking

I have left behind a trail of unsolved questions related to issues such as: who decides who the 'relevant' actors and practices are? When and how is such a decision taken, if at all? Who perceives a problem worthy of a networking effort? Why? Who says networking may solve it? Who formulates the 'theory of intervention'? Who determines the mission networking efforts are to accomplish? One of the most consistent issues in the study of networking for innovation is its arbitrary nature: different social actors perceive similar situations quite differently and come to different and often conflicting proposals for intervention. Following Vickers (cited in Checkland and Casar, 1986), I propose to refer to this issue as the *appreciative nature* of networking for innovation. Vickers proposed the term 'appreciation' for selective perception of reality and making judgements about it. Also, he stressed the intrinsic relationship between judgement-making and social relationship-management. Social actors, at all times, choose to establish and maintain relationships with such others as they judge relevant to their (common) project and, at the same time, rely on these same relationships to keep themselves informed about what is relevant and what not. As a consequence, their appreciations can not be isolated from the social context in which they take place. For example, the appreciations I have suggested lay at the root of an actor's decision to 'network' (chapter 6) depend upon their judgement with respect to (1) the availability of relevant experiences, knowledge and information with other actors and (2) the degree to which they expect to be able to acquire access to these actors, (3) the benefits they expect, and (4) at what (financial, material or social) cost?

Then, of course, their is the issue of power and influence. Which of the actors has the capacity to stimulate or stop networking activities? Who may decide whether a specific social actor belongs to the network, or not; and on which grounds? Who has the power to establish links with relevant practices; and who decides which ones are relevant? Who influences the emergence of a 'theory of intervention' mostly? Just as one example, we may refer to the discussions with regard to sustainable agriculture today. Topics for discussion are for example traditional practices. Are they to be taken seriously? Does 'relevant diversity of opinion' include efforts have to be made to include traditional practitioners in our networks? Should investments be made in research to rescue such practices, or at least to understand them? And if we do, who 'owns' the results? And who has to make such investments? As a direct consequence of answering these and other questions differently, a large variety of networking efforts have surged in a parallel manner, the members of some of these hardly even being on speaking terms.

The appreciative character of networking demonstrates itself most strongly when decisions are to be taken among networkers which have a bearing upon the operational freedom. Firstly, when the problems to be tackled through networking are assessed, when individual strengths, guiding principles and expectations are formulated and, eventually, a *theory of intervention* is defined (who is to contribute what, why, how and to the benefit of whom?). Such a process may respond to intentions such as in the case of the NGDO networks we studied, or may be self-guiding as long as some infrastructure for networking is accessible to all. A famous case of 'spontaneous' networking was caused by the appearance of 'social' 06 telephone numbers in the Netherlands, which encouraged people to engage in social intercourse by telephone and created a new form of addiction. The less formal a network, the less a 'theory of intervention' is made explicit. This does

not mean however that no such theory could be formulated on the basis of actual networking practice. A second instant when the appreciative character of networking comes to the fore, is when *rules for membership* are laid down, even if only informally. The expression, often heard among networkers, that they intend to liaise with 'like-minded' social actors only, is indicative to the fact that even if no specific criteria for selection are formulated, selection still takes place informally. The third instance is when an *approach to running the network* is developed, when joint activities, required contributions, services and operational procedures are designed and implemented. Only then individual members can weigh eventual benefits and possible negative consequences for their own operations, against the efforts required from each of them. And fourth, when the success or *performance is evaluated.* In all of these instances the world views, partisanship and expectations of each of the participants is challenged and set against those of the others. In each instances the 'platform' (Röling, 1994), hitherto so carefully constructed, squeaks under the weight of argument.

As I have shown in chapter 6, in case such a process is made explicit and all (prospective) members are stimulated to participate in it fully, the struggles that emerge may take time and energy, but at the same time, it can be argued that surviving such an initial 'battle over images' is what makes a network succeed. It is in such a struggle that the basic rules evolve and networking becomes 'innovative social practice'. As a consequence, different networks will evolve when some social actors impose their project upon the rest, as compared to a situation in which a relative balance of driving forces is successfully maintained. I propose 'networking' can usefully be thought of as an emergent social 'meta-practice' or 'joint performance' (Gremmen, 1993) laying at the core of what social actors do to improve their practices.

I conclude that it is through networking that social actors organize the interplay among practices they consider relevant to their concerns. Networking is what social actors do to construct a social competence for innovation. The next paragraphs are dedicated to a further characterization of networking as an emergent social practice, the issues of coordination, power and influence and the forms of social organization which can be seen to evolve as a result of sustained networking efforts by social actors in complex agricultural innovation theatres. Eventually, I will conclude by answering my central research questions with regard to the social organization of innovation.

7.7 Innovation as a result of unending social inquiry

One of the consequences of what we have proposed is that innovation has to be looked at as a social process. New or modified practices appear as a result of interactive relationships between social actors. I want to take the definition of networking for innovation one step further by arguing that networking, in fact, is a process of unending social inquiry. In *Inquiry and Change*, Lindblom addresses "...social inquiry or the production of social knowledge as a vast social process in which even relatively uninformed, ordinary people play significant parts...", in addition to professionals, politicians and opinion leaders. His starting-point is that preferences, wants, needs, or what it is that serves peoples interests, "...are not discoverable - not even to a degree that warrants an attempt at discovery (Lindblom, 1990: 18). No 'bedrock' of objective or

scientific 'best ends', 'best means', 'best solutions' or 'best situations' exists for social scientists to discover. Decisions do not derive from wants, wants derive from decisions. A decision is needed to decide what the wants are to be. As a result, in social processes of innovation not only the means but the ends are disputed as well. Social actors permanently (re)create, rather than find or discover preferences, wants and needs. What they create, Lindblom names a *volition*, stressing commitment or will."Building on a foundation of fact, poorly or well constructed, people (never alone but always in social interaction) form, create, decide, will....volition[s]" (Lindblom, 1990: 21).

The concept of *volition* emphasizes *sense-making* on the one hand, in creating comprehension and purpose and, on the other, *commitment* to stick to certain decisions made. It also entails *fluidity*: an informed and thoughtful volition, strictly speaking, is never in error, yet always subject to challenge or reformulation. Challenging it means to challenge both means and ends. Lindblom recognizes two extreme types of volitions: the relatively stable, *standing volitions* and the more transitory *action volitions*. Each of these can be expressed in language and/or action. Similar to what was said about the general intentionality behind innovation processes, a volition shows purpose and determination even if no objects or results are specified in advance. The concept of 'volition' offers a way of practically investigating the views different social actors hold when they start or maintain a network or configure institutional cooperation. Volitions might be taken as the 'projects' Long (1992: 24) social actors try to enrol other actors in. The strategic consensus eventually achieved among core actors in Nariño, described in chapters four and five, reflects the slow process of establishing a shared volition among different institutions. As a result a successful institutional coalition emerged. In fact, a volition is the 'theory of intervention' of a social actor at a particular point in time.

That a *convergence* in ideas, opinions and approach is not only the result of active strategizing amongst institutions, but also by small-holders is illustrated by Paulino's choice (chapter 4, par. 4.4). Small-holders base their volitions on their understanding of their own position as potential beneficiaries of the programme. The case of Paulino demonstrates in the extreme the flexibility needed to achieve a concrete, innovative solution in specific circumstances. The farmer, Paulino, arrived at a perfect fusion of technical, economical, geographical and practical knowledge and information to design his particular solution, adapted to his particular circumstances and ideas. It took time, of course, and it took a lot of energy, for example to convince the bank that a housing loan could be accommodated to finance the building of a fancy house for guinea pigs (sic!). The case describes a process of convergence between three different types of social actors in a complex innovation theatre, each entertaining quite different ideas of what rural development is all about.

Paulino himself had decided guinea pig raising could be profitable for a farmer in his circumstances, but had no capital to make the necessary investments. The Colombo-Dutch project had concluded guinea pig raising was economically feasible for small-holders and wanted to experiment under farm conditions, yet had no sufficient means to compensate Paulino fully for his risks. The bank, on the other hand, had two lines of credit for small-holders under the integrated rural development program, one for productive investments and one for housing. Within the program, both were aimed at improving the livelihood of small-holder families. The central philosophy behind the program was to enable small-

holder families to generate an adequate family income. In this case, the extension service and the bank were flexible enough to support Paulino. But both institutions stretched normal bureaucratic discipline to the limit. Naturally, convergence upon this particular solution was possible only once, while the program did not have an adequate way of dealing with the introduction of improved guinea pig husbandry among small-holders yet. Later, lines of credit for raising guinea pigs were implemented. What happened to Paulino marked the institutional recognition of the specific factors involved in stimulating innovation in guinea pig husbandry at the farm level. It illustrates also that small-holders may actively contribute to probing volitions, options and constraints to innovation. More than anything else, it illustrates that in designing and implementing specific innovation strategies the means/ends combinations which eventually prove effective may not turn out to be exactly as they had been planned in advance. I conclude it adds importance to the 'fluidity' Lindblom argues as an essential element of a volition, unless the views, propositions and intervention designs social actors entertain are flexible, wide-spread innovation will be very hard to achieve.

The example adds evidence to another of Lindblom's arguments. He argues strongly against reducing the struggle with social problems to scientific problem solving. He points out 'problem solving' is a misnomer; it would be better to speak of 'attacking' or 'grappling' with problems, as some problem solving lacks intent. Nobody could have intended Paulino's, the project's and the bank's problems to be solved like this. Still, it was done. And in essence, this was a relatively simple, straightforward problem. In the grappling with complex social problems, often "no one ever decides on each series of interim solutions that emerge" (Lindblom, 1990: 5). We propose to extend these arguments to cover complex innovation processes. We have argued that in a process of innovation, both 'professional' and 'lay' practices play a role, while both the natural and the social world are changed. With the exception of very few, the wide-spread use of technical innovations in agriculture cannot be achieved without important social and organizational adjustments. Innovation in agriculture, therefore, should be understood as a process of social problem 'grappling' rather than as a purely scientific or technical problem. As all social problems, it arises only "...when people look at a state of affairs in a particular way: specifically, with a desire for its improvement" (Lindblom, 1990: 4).

This seems particularly relevant to our reflections. We have repeatedly encountered the appreciative character of networking for innovation. One of the reasons for this, we propose, is rooted in the way social actors look at the world and intend to improve it, in other words, their volitions. However, the way in which social actors formulate and enact their views, and hence define the problems to be solved, leads them to favour certain solution strategies more than others. The developments during the seventies and eighties in Nariño may illustrate this point. Whereas in the sixties and early seventies, the problem of small-holder production was mainly defined in terms of *lack of association* for both production and marketing, in the late seventies and eighties the institutions converged upon a definition emphasizing *lack of on-farm productivity*. The subsequent disintegration of many of the associations established earlier, to a considerable degree could be associated with the withdrawal of institutional assistance (Moreno and Villota, 1984). The latter problem definition, as we have shown in chapter four, did lead to a successful convergence of government institutions on technical and credit support to a specific target group of small-holders.

Such grappling with complex social problems is an inquiry that never ends. It proceeds in a broad, open-ended, diffuse social process in which both ends and means are shaped and reshaped continuously, as a result of social interaction amongst relevant actors. What actors do in the process Lindblom (1990: 7) calls 'probing'. *Probing* "...captures much of the flavour of the process, since it emphasizes persistence and depth of investigation, uncertainty of result, and possible surprise; but it suffers, for present purposes, from its medical connotations". Often, the inquiries are not immediately related to solutions, the interactive process, never less than a variety of inquiries into an area of concern by different actors, becomes a process of "...bringing inquiry and knowledge to bear in such a way to alter dispositions and positions so that they make a solution possible later" (Lindblom, 1990: 6). The inquiry into guinea pig production, initiated by the Colombo-Dutch project in Nariño illustrates this point. As we showed, it never became a priority to either agricultural research or the integrated rural development program DRI (table 8, chapter 4). Still, other actors, notably farmers and extension, gave it priority anyway. They recognized its potential for eventually providing a viable alternative for small-holders, including women. The process of inquiry eventually included on-farm research, experiments by agronomy students, the establishment of an association of producers ('ASOCUY'), the initiation of a specific credit facility and scientific research into health problems in guinea pig husbandry. Active networking was supported by seminars, communication media and subject-matter specialists and reached as far as Perú when the Colombo-Dutch project brought in a guinea pig specialist from there.

The example of Paulino already illustrates that probing for innovation is a social, interactive process. Lindblom (1990: 36) suggests that, in such cases, "...formulating a problem calls for inquiry no less than does formulating a solution to a formulated problem. *The origin of a social problem lies in the probes that declare it to be a problem*" (italics added; PE). This was illustrated in chapter five and six, when we described the struggles of (non)government development organizations to establish effective networks for enhancing agricultural development. What we labelled the phase of 'planned activism' in chapter six is exactly that: probing alternative problem and action definitions and eventually accepting one that works best for most of the network members. The appreciation of problems has as much to do with the way relevant social actors look at the situation as it has to do with the way they expect to be able to solve it. The sense-making of social actors about the situation appears to be closely related to the policy context and mission they ascribe to the innovation theatre, on the one hand, and the resources they command to intervene in it, on the other. I will illustrate this with some examples from the ISNAR case studies.

When the Government of Côte d'Ivoire, in 1978, decides to shift from a sectoral to a regional approach, it does so to make use of its commercial commodity development corporations to promote the food crop production. Through this policy shift, the Government intents to build upon the positive experience of these corporations with developing cotton and rice as commercial crops, to effectively support rural development at the grass roots level. The corporations are to become regional development corporations. Their capacity to operate effectively is seen as the solution to the apparent lack of effectiveness of the government extension services. Also, it befits a more 'hands-off' national policy and regionalization of efforts. However, the outcomes are less than expected (Eponou, 1990a,c). The corporations continue to be very effective in their commercial crops but

with no adequate additional funding for research and extension support fail to generate a similar success in food crop production. One conclusion seems obvious: the problem situation affecting food crop production cannot be taken to be a problem of 'organizational effectiveness' alone. A similar example comes from Tanzania. The National Coconut Development Programme (Lupanga, 1990) intended to make relevant coconut technology available in large enough quantities to achieve an overall renovation of the Tanzanian Coconut industry. When large-scale impact was not achieved, its lack of integration with market parties was pointed out. From a 'technology problem', the decline of coconut production was now recognized to be, at least partly, a 'market problem'.

Another example concerns the reasoning with regard to direct government intervention in favour of agricultural innovation. In line with the progressive liberalization of agricultural production and markets, the view that exposing innovation theatres to market pressures leads to better performance is amply supported in the case studies. The conclusion that many agricultural innovation theatres traditionally have been sheltered too much from such forces, therefore, doesn't really come as a surprise. On the other hand, the lack of consistent and effective policy support is frequently mentioned as a cause of problems. Ekpere & Idowu (1990a: 15) mention the lack of policy guidelines for collaboration and functional linkages between relevant actors. Frequent shifts in policies, often in combination with shifts in the allocation of resources, are reported frequently as well. Palmieri (1990b: 55) refers to the lack of interest of the government of Costa Rica in promoting the technification of maize cultivation, for fear of producing in excess of national demands, while the world market price had dropped below national production costs. Perez (1990:26) and Azucena (1989:198) indicate the lack of effective price policies to support technological innovation at the farm level. Apparently, the appreciation of the causal relationships concerning the effectiveness of social interactions in agricultural innovation theatres depends very much on the policy perspective one embraces. This may even lead to a certain duplication of efforts when different financial donors decide to support different organizations to intervene in the same theatre independently (Arocena-Francisco, 1989).

From the examples above, I conclude that the appreciation of problematical situations in complex innovation theatres merits thorough attention in each particular case. As is indeed clear also from the conceptual and organizational struggles which precede the formation of NGDO networks (chapter 6), formulating a problem requires as much inquiry and accommodation as does formulating the appropriate solution strategies. The multiplicity of actors generally involved, I may add, probably causes as many volitions and solution strategies to exist as there are actors who intend to intervene on behalf of innovation. Negotiating a (partial) consensus amongst them may have to be a part of any solution strategy proposed to intervene in complex agricultural innovation theatres. Hence, the continuous probing of relevant *volitions* (ways of making sense out of possible means and ends), *propositions* (feasible alternative proposals to achieve those ends) and *conditions* (social and/or natural constraints) seems to be one very important element of networking for innovation in agriculture.

Here I may add an observation on practices as I have identified them. To a large degree what binds a practice together may well be its way of identifying or defining problems. In agricultural practice, it is a fact of common knowledge that when called to look at the

same practical situation, the soil scientist, the economist, the entomologist, the irrigation engineer, the veterinary doctor, the extensionist and the crops specialist will all define the existing problems and solutions in vastly different terms. This has been one of the most powerful arguments in favour of forming interdisciplinary project teams for years and of doing interdisciplinary appraisals to identify problems in agriculture. It points at the role of knowledge - as well-probed beliefs - in narrowing down the scope and range of options which are considered to be relevant to a particular situation. Interdisciplinary efforts in agricultural development are in fact attempts to reduce such impairments of inquiry by developing an 'interdisciplinary' practice to face complex situations.

7.8 Coordination, leadership and power

In this paragraph I will focus on the social dynamics of networking for innovation: the use (and abuse) of power and influence for achieving coordination among social actors in complex innovation theatres. As I have indicated earlier, I do not pretend innovation to be a planned process. To the contrary, the process of innovation in-and-amongst practices is largely self-guiding. It is a social, interactive and diffuse process of inquiry social actors engage in actively. It is not generally a process actors have to be pushed into. Generally, no one has to organize social actors in order for them to become innovative. Social actors organize themselves in order to improve their practices. As a consequence, networking for innovation can be seen as part of the competent performance of farmers, for example in the Netherlands (Grooters, 1990; Adolfse and De Koning, 1993). But this is no different for small farmers in developing countries. An increasing amount of research reveals small farmers to be active networkers and innovators (Box, 1989; Pijnenburg, 1989; Box et al. 1990; Stolzenbach, 1991; Brouwers, 1993; Alders et al., 1993). Therefore, I subscribe to Lindblom's proposition that: "Everybody always probes....We supplement the most casual inquiries with scattered active investigation....Inquiry mixes with and advances through action, for we do not first probe and then act but continue to probe and learn in every action we take" (Lindblom, 1990: 30). Governance of innovation processes can therefore not be understood generally as directed or steered by one or a limited number of actors. Where a direction can be discerned at all, it can only emerge from the social struggles, negotiations and accommodations amongst *a variety of actors defending diverse concerns, interests and positions*. Any attempt to look at it as a one-sided, centrally managed process is bound to succumb in simplified, partisan views.

How then does a direction or trend evolve in complex agricultural innovation theatres? What causes social actors to coincide in the perspectives and means they apply to their appreciations and interventions? And what characterizes social actors which, one way or the other, are able to enrol others in their project? Even self-guided social inquiry requires some degree of organization, certain tasks are to be recognized and fulfilled. How come certain volitions are well-probed, whereas others are left untended? Why is it that certain propositions are experimented whilst others are hardly looked at? Why is it that certain conditions are taken for granted, whereas others are considered changeable? And why is it that in decision-making certain alternatives are favoured whilst others are hardly considered? And who takes relevant decisions with regard to probing for innovation? Our evaluation of case study materials suggest these questions can be usefully looked upon as a problem of *coordination* (ch. 5). Of course, referring to 'coordination' we do

not mean straightforward top-down control. As Mintzberg (1983) points out, this is only one way of achieving coordination and only effective or even feasible when particular conditions are met. Such conditions like a unified management structure and charismatic leadership are extremely rare in complex innovation theatres.

Our case study in Nariño (ch. 4) shows the importance of achieving some degree of inter-institutional coordination in order to achieve an impact with regard to technological innovation at the farm level. Also, we deduced from that experience three factors relevant to explaining the achievement of such coordination among the relevant institutions. The first was strong *institutional leadership* and *strategic consensus* among core institutions as to the intervention strategies to be implemented. Moreover, *resource allocations* were tied in closely to well-defined and reinforced institutional policies and priorities. Our findings confirm the view expressed by Long (1992) that agency and power "...depend crucially upon the emergence of a network of actors who become partially, though hardly ever completely, enrolled in the 'project' of some other person or persons. Effective agency then requires the strategic generation/manipulation of a network of social relations and the channelling of specific items (such as claims, orders, goods, instruments and information) through certain 'nodal points' of interaction" (Long, 1992: 24). Effectively, the DRI program was able to impose its leadership via a deft use of its financial resources, literally enroling them in its 'project'. The Colombo-Dutch ICA-CCH Project was effective because, from 1978 onwards, it used its resources to complement the DRI programme. Partly because of it, ICA could maintain technical leadership over the process. A further review of the ISNAR case studies in chapter six confirmed the importance of institutional leadership, strategic consensus and resource linkages in forging institutional configurations. We conclude that these three factors possibly play an important role in building the *coalitions of actors* able to mobilize the resources necessary to implement certain solution strategies.

In addition, we identified a number of specific task-related linkage mechanisms were identified and associated directly with high institutional performance and impact. We argued that these provided joint learning opportunities facilitating the integration of knowledge and information from different relevant sources, including farmers. Combined with what we know from our first case studies (ch. 3) we may argue that, in fact, through these and similar practices *multiple communication networks* evolve which at any point in time provide participants with the opportunity to learn from, and share experiences and exchange information with others. During the case studies we found that such networks involve a great many social actors and a large number of communication media, all of which have a particular role to play. We have suggested such networks to be value-added communication networks as every participant adds a particular value to the information which is exchanged by transforming it into advise and/or information directed at particular types of audiences.

But once established, how is this institutional configuration maintained? In chapter six we also pointed at the *specific coordinating mechanisms* which may play a role in coordinating the tasks between social actors in complex innovation theatres: several ways of standardization, direct supervision and control, and mutual adjustment. In companies, one may argue, in principle a hierarchical power structure exists which may impose central control. Mintzberg (1983) shows that the 'strategic apex' is only one of several types of

actors in the organization who generate a 'pull' to reinforce coordination, each favouring its own type of coordinating mechanisms which - though sanctioned of course by the hierarchy - provide each of them with ample influence upon the way coordination of tasks is achieved. In modern organizations, he argues, next to direct supervision and standardizations, mutual adjustment amongst different members, or units, within the organization becomes more and more important. Also Lindblom (1990: 250) shows that centralism not a necessary condition for achieving coordination. Coordination between social actors is often achieved by mutual adjustment, motivated not solely by desires for coordination but by desires to remove obstacles to new achievements (Lindblom, 1990: 251). Lindblom' (1990: 250): "...nothing coordinates a team of soccer players more effectively than their mutual adjustments, even if...coordination is not perfect, nor wholly unassisted by central authority."

The maintenance of a strategic consensus may be explored a little further with the help of Lindblom's concept of *convergence*. "A convergence is a narrowed range of thought or attitude ... [and/or] ... of variation in attitude, belief, value, or volition. Never or rarely does it approach a unanimity or a consensus" (Lindblom, 1990: 71). What we have called a 'theory of intervention', stipulating what is to be done, by whom and for the benefit of whom, is such a convergence. Once the institutions in Nariño had formulated their joint mission *to improve the income of small-holder families in the Nariño Highlands through the introduction of improved technology at the (individual) farm level*, 'small-holder farmers' became farmers with less than 20 hectares, and other options for intervention, such as organizing farmers into groups to 'pull down services' or identifying and improving upon local technologies, to name just a few, were discarded. Still, not every one of the institutions acted entirely within the scope of this mission. The guinea pig improvement programme did make an inventory of local knowledge on guinea pig husbandry and did initiate a guinea pig raisers' association: 'ASOCUY'.

What is it that causes convergences in volitions or propositions to occur? Lindblom directs his argument mostly by pointing at impairing influences or factors limiting the extent to which probing of alternatives occurs. Well-probed, carefully formulated volitions (such as *small-holder income can be improved by introducing improved technologies at the farm level*), as well as acquired knowledge itself are impairing influences he argues. Well-probed beliefs may lead to propositions which go largely unchallenged: the highly 'verified' ones are considered 'fact', the less 'verified' ones are taken as (expert) 'judgments' (Lindblom, 1990: 123). The 'linear model' of thinking about agricultural innovation has long represented such a convergence among extension scientists, as Röling (1994) has pointed out.

Other *impairing influences* may be rooted in socialization processes, culture, communication, and the use and abuse of power by advantaged groups. For the student of agricultural innovation theatres these observations are all too familiar. School education of agricultural extensionists, generally, creates a bias against traditional knowledge which often impairs useful communication with farmers. Cultural impairments include lack of respect for traditional wisdom, spirituality and long-established customs in agricultural practices (Brouwers, 1993). Only now, the value of traditional seed varieties is again recognized in the scientific community (J. Hardon, interview WUB, Oct. 1993). Mass communication media may play an important role, positively or negatively. In Indonesia,

the media continue to promote the use of chemicals, while a national effort is under way to promote integrated pest management in Indonesia (Van de Fliert, 1993; pers.comm.). On the use of power, Lindblom offers an interesting hypothesis proposing that certain patterns of impairment are "... being supplied by defense of elite advantages" (Lindblom, 1990: 128). This hypothesis strikes me as particularly relevant in searching for explanations for the relative difficulties social actors seem to encounter in many countries in the world when implementing strategies for a more sustainable, environmentally sound type of agricultural production.

However, in agricultural innovation theatres some convergences seem to reflect *leadership* more than patterned impairment. As we have shown, certain social actors are able to markedly influence the events and ideas amongst other actors in agricultural innovation theatres and enrol these in their projects. The role of DRI can be recognized as such (ch. 5). The same can be said of those NGDOs who lead the networking efforts discussed in chapter 6. We have shown that specific coordinating mechanisms are operational in imposing and maintaining such leadership. Only when it is challenged fundamentally may one expect the 'defense of elite advantages' to become noticeable. This can be the case in the instances we have identified earlier on when, explicitly or not, basic tenets of networking are the subject of discussion, or even disagreements among the participating actors. Lindblom hinges upon leadership also when he argues that improved social inquiry alone is not sufficient for improving social problem solving. Probing, he argues, cannot carry people all the way to decisions or solutions to social problems. Particularly when conflict resolution is at stake, it may be supplemented by the imposition of solutions, especially by the state (Lindblom, 1990: 54). Environmental legislation constraining farming in the Netherlands is a case in point. Initially very much against the wishes of the 'agrarian lobby' a number of restricting laws and regulation were imposed by the state. At the moment, very few still argue against the need for such impositions. Two possible explanations may be offered. Perhaps some actors or coalitions of actors - this could be the EEC or the environmental lobby, in any case not always the national state - have been powerful enough to impose their 'projects' on others. And get away with it. Most of the time however, Lindblom argues, a certain degree of mutual adjustment occurs between actors forming coalitions or alliances behind carefully probed, often reformulated and cautiously worded volitions. In the case of the Netherlands, both seem to have played a role in forging the convergence which eventually caused the protests to fade away.

This leaves one important question open: leadership and impairment, convergence and divergence, may be different sides of the same issue. Depending upon the (partisan) position one takes as an observer what appears as leadership to one may appear as impairment to another. Those already enrolled in projects based upon a shared volition, may see convergence as 'the natural course of things', whereas those resisting that particular type of solutions will fight to obtain space for developing alternative ideas. For the moment, we will not go into this matter any further. It helps to underscore once more the appreciative, potentially partisan, character of observations in studying the social organization of innovation. It also underscores the need to open a 'window' on the power struggles underlying the coordination of tasks for probing and innovation. Whether we take facilitation to mean reducing impairments or stimulating leadership and coordination, this is no different.

7.9 Towards an action-oriented theory of social organization for innovation

In this paragraph I will propose answers to the research questions that provoked my 'exploratory path':

Q1 *How do different actors or parties organize themselves in order to achieve agricultural innovation? and*

Q2 *What do social actors actually do in order to achieve the transformations they aim at?*

Before doing this, let me first outline the characterization of innovation itself it rests upon. I have argued *agricultural innovation* emerges from the interplay between social actors from relevant social practices. It is a diffuse, social process of both individual and collective inquiry and decision-making with respect to volitions, propositions and contexts which continuously leads to new or modified problem definitions as well as choices for particular practical solutions. The organization and quality of the interplay determines the course and quality of innovation. The *social organization of innovation* may then be characterized as the way in which social actors organize themselves and perform the interplay. In order to start with the more concrete one, in the following I will first answer question what actors *do* and then how do they *organize* themselves for innovation.

In answer to research question Q2, my studies suggest that what social actors actually do in order to innovate their practices may be qualified as *networking in-and-between relevant practices*. In order to gain access to a range of options and insights, social actors actively engage in building and managing interactive relationships with social actors from their own and/or other practices whom by some standard they consider relevant to their concerns. Such standards may vary widely. They evolve as a result of networking for innovation within a particular social context. Not all networks are the result of networking for innovation. Networking as innovative social practice is characterized by (1) the creation of joint learning opportunities among social actors who perceive each other as relevant to their innovative concerns, (2) the probing of relevant volitions, propositions and contexts and (3) the pooling of energies and, often but not necessarily, other resources in order to implement particular innovation strategies.

Probing is taken as interactive, diffuse and practice-oriented learning-in-practice, allowing for a study of conflicts over volitions, technical and organizational solutions, partisanship, power and impairing influences. *Volitions* are the 'projects' actors express, in language or action, to make sense of their contribution to innovation and social change in agriculture. *Propositions* refer to the (social) organizational and scientific/technical solution strategies which are identified as relevant to certain volitions. *Contexts* refer to the socially constructed as well as the natural conditions which reduce the degrees of freedom for actors to create/choose between volitions and propositions.

My findings suggest a direct relationship can be postulated between the *quality of the networking* and the outcomes of the innovation process. Social processes of inquiry into new means and ends, into (re)defining problems as well as (re)formulating political, technical and/or organizational options are key issues. These processes of inquiry are not limited to intellectual endeavours but concern (experimental) processes of change in both

the natural and social world. Communication plays an important role in creating and maintaining relationships, in facilitating the exchange and interpretation of experiences and ideas. At the same time networking is tied closely into the daily work social actors are engaged in, so that mutually beneficial activities, services, exchanges of advise and information play a fundamental role as well often lay at the roots of networking for innovation. The *appreciative character of networking* stems from the need to make choices continuously. While networking, participants are required over and over again to make decisions on whether to include in the networking effort a particular actor, practice, volition, proposition or context. A decision to include takes energy, time and/or money and can only be justified when the element in question is perceived as relevant to the inquiry. As a consequence such decisions are arbitrary ones, taken within the context of the current relationships between stakeholders in a particular innovation process.

As a conclusion I suggest that social actors through active networking construct a dynamic social context for joint learning, probing and resource pooling among social actors who perceive each other as relevant to their concerns. In a logical sense, networking does not have to be separated from social practices in general. It may be studied as one of many social practices, this one particularly relevant to innovation. However, as it concerns a 'meta-practice' or 'joint performance' (Gremmen, 1993: 148) between existing practices and lays at the core of what social actors do to innovate their (technical) practices, particular attention to *networking as emergent social practice* seems more than justified. It should be concerned with the way in which relevant actors weigh and adjust their volitions, propositions and/or their assessment of contextual factors, in order to achieve the design and implementation of particular transformations. Besides it should look at the nature of innovation strategies: whether they aim at increasing the richness of probing for relevant volitions, propositions and/or conditions or, alternatively, aim at achieving convergence with regard to well-probed solution strategies to tackle well-probed problems. Probably, most of the time a combination of the two occurs.

In answer to research question Q1, I suggest the way social actors organize themselves to take part in, and possibly direct, the interplay can be characterized describing the structural forms which emerge as a result of sustained networking and studying the relationships that exist between them. My studies suggest the following to merit particular attention from students of the social organization of innovation: (1) convergences, (2) resource coalitions, (3) communication networks, (4) innovation configurations. These represent, in Long's (1989:228) words, macro-structures which come into existence largely as the result of unintended consequences of social action. As *emergent forms* they are not (fully) describable or explicable in terms of micro-events. They demonstrate dynamics of their own. "Macro-structures are in part the result of the unintended consequences of numerous social acts and interactions which, as Giddens (...) explains, become the enabling and constraining conditions of social action itself" (Long, 1989: 229). Lindblom converges on the same point: for social problem solving Who is to blame? or Who made this decision? often are foolish questions. Whatever the outcome "...it follows from complex interactions of countless influential participants, most of them at a great distance from the place and hour of decision....As a consequence, one finds that outcomes often seem not to have been decided upon but simply to have happened somehow....No one ever decides on each series of interim solutions that emerge" (Lindblom, 1990: 5).

Convergences emerge when social actors narrow down the scope of their arguments and the range of issues and alternative scenarios they consider relevant to innovating their practices. Consensus must be seen as the exceptional case. Lindblom (1990: 39-41) argues strongly that people do not usually seek consistency in the set of volitions they hold. Some coherence maybe, in the form of a web "...stretched across the ground of experience, serving as one of the structures that unifies it" (Lindblom, 1990: 40, referring to Shapiro, 1981, and Scriven, 1967). We propose that convergences, therefore, cannot be taken to mean mutually exclusive clusters of ideas, views or propositions. With every new experience, every new exposure, new discords creep in. Convergences may be most recognizable in the issues social actors address when they outline the desired direction innovation is to take.

Resource coalitions emerge when social actors decide to pool their resources in a joint performance. They are the result of strategizing by social actors who use their assets to enrol others in their 'projects'. Leadership patterns and/or impairments to probing and coordination may be recognized as a result. Studying such coalitions will require the analysis of the instruments of power and influence which are used by social actors in complex innovation theatres and the analysis of their use in forging alliances and imposing or negotiating the participation of relevant actors in proposed innovation strategies. *Communication networks* emerge as a direct consequence of social actors decisions to create joint learning opportunities and to produce and exchange information among themselves. Particular communication practices are adopted to exchange experiences, ideas, knowledge and information. A diverse range of communication media may be utilized from interpersonal to mass media, from formally constituted channels to informal ones. The complexity of agricultural communication networks (chapter 3), as a result of the autonomy of each of the social actors and the diversity of means and media, in my eyes, justify treating them as emergent forms rather than designed forms, even if each of the individual components, such as a farm journal, ad advisory service, corresponds to design.

In my view the study of social practices, networking and emergent structural forms can yield important insights into the social organization of innovation in complex innovation theatres, each of them opening a related yet different perspective upon social interactions for innovation:

> ***Relevant practices and emergent forms of social organization (some examples):*** The social practices which proved relevant to the study of the social organization of innovation in Nariño included: farming, both traditional and 'improved', extension, research, lending, processing and marketing of produce, training, funding and management. Other case studies called attention to policy making, product quality control and training. Naming relevant practices forms a first step in defining the innovation theatre. Strategic consensus mirrored the existence, at that time, of a convergence between core actors in Nariño. Besides, DRI resource allocations reflected the existence of a resource coalition among core actors, while increased integration through the use of particular task-related linkage mechanisms revealed intensive networking during the period impact seemed to be at its highest (ref. chapter four).

However, not all forms that emerge as the result of networking for innovation can be taken as equally unintended. Actors in theatres of agricultural innovation have long recognized the need to organize themselves, to develop the capacity to reflect, decide and act in favour of agricultural innovation collectively. As a result, in most countries different types of organizations have been set up: advisory and extension agencies, research institutions, policy making bureau's, research and development units, auctions, agricultural information bureau's, liaison units, farmers' organizations and the like. Many of these organizations have been specifically designed to facilitate innovation in agriculture. Besides, policies, resource allocations and networking practices have been designed and implemented to induce a specific form of social organization for agricultural innovation.

Over time, networking may lead to the gradual development of a pattern of more or less durable relationships between a number of social actors who perceive each other as relevant to (some of) their concerns. The cases we studied in chapter 4, 5 and 6 present examples of such *innovation configurations*. Such configurations harbour the accepted views, procedures and ground rules for collective behaviour with respect to (a particular type of) innovation. In such configurations, convergences, resource coalitions and communication networks come to coincide enough to make strategic consensus, a clear definition of tasks and responsibilities and a rational allocation of resources possible. While in most cases it seems hard to think of 'orchestrating' innovation processes, a configuration provides a context in which thinking of at least coordinating innovative efforts is not outrageous. Still, such emergent alliances are in flux continuously, they may take unexpected or even largely unintended turns, yet at their roots lies a common concern shared between a number of relevant social actors. Only if social actors remain willing and able to negotiate and effectuate mutual adjustments, their configuration may eventually become and remain well-organized and stable. Adequate institutional leadership, an agreed upon division of tasks and effective coordinating mechanisms are then in place.

Generally, a lot of epiphenomenal problem solving as well as 'divergent' institutional behaviour remain. In fact, as I have argued in chapter three, divergent behaviour by social actors who form part of an innovation configuration may be one of the elements that explains success in achieving wide-spread innovation. Also, not all actors of a configuration may explicitly want to express their convergences. For example, to maintain its own identity as a successful development project, the Colombo-Dutch ICA-CCH Project had to navigate carefully in order not to be seen as 'fully absorbed' into the DRI Programme. The value it added to the DRI programme had to be stated clearly in the eyes of the other parties involved, including DRI, in order to continue receiving external resources. From our studies it becomes apparent that many different types of innovation configurations emerge according to the way it is formed, the type and mix of participants that is created, the way a balance of driving forces is achieved, etc.

In our studies we have looked particularly at *institutional configurations*, alliances for innovation as they emerge between government or semi-government institutions, industrial companies and/or farmers organizations. It becomes apparent that, depending upon the type of leadership and the way coordination is achieved, many different types of institutional configurations may evolve. And not all seem equally adequate to meet the

innovative demands of modern development. Therefore, we have proposed configurational analysis as an instrument to study the effects of leadership and coordination upon innovative performance.

The patterns which evolve as a result of networking by farmers, professionals or (non-governmental) organizations in order to increase their scope and capacity for innovation seem to represent a different type of configuration. As in other configurations, convergences, resource coalitions and communication networks may coincide enough to provide the *innovation network* with purpose and organizational strength. The difference with institutional configurations, however, seems to lie in the intentionality behind the network and the way in which it has been created. Our study suggested that networks among agricultural NGDOs are created *intentionally* as a space for joint learning and reflection. Mutual interdependence is a given, recognized by all involved. Besides, not only technical solutions but also intervention objectives are subject of debate. Active participation of all member organizations is not just a formal requirement, it is a working standard. The formative process is taken as an opportunity to build a strong foundation for future cooperation, not just as an opportunity for renegotiating the institutional balance of power. In addition, networks not only recognize mutual interdependence, they nurture it by means of programmes for mutual support, services and, sometimes, by taking part in the public debate jointly. Probably the largest difference between the institutional configurations and the NGDO networks we studied lies in the focused, conscientious and transparent way in which the members of the latter laid the foundation for collective agency.

In all, preliminary evidence suggests that innovation networks may prove to be the more flexible forms of innovative alliance modern development needs. Networks capable of dealing with the continuous struggles over membership, means/ends combinations, rules, tasks and responsibilities, mission and performance as opportunities to strengthen reflection and learning rather than as a threat to their existence, might become the social 'flex-forms' for innovation agriculture needs so badly today. However, this can only be true if networks succeed in maintaining themselves as 'learning systems', dedicated to high quality networking for innovation. For government institutions to be able to participate in such networks actively, a number of requirements would have to be fulfilled. Firstly, networking requires a number of social actors not only to be 'like-minded', but also to have a fair degree of autonomy to adjust their views and strategies when need arises. Hierarchical power structures such as exist in most government bureaucracies seem to be at odds with networking for innovation. Central authorities would have to 'draw back' from controlling day-to-day operations in order to facilitate effective networking among government and other agencies. Besides, whether government authorities would ever be willing to cede to decentralized government institutions the time and space to 'test the waters of cooperation' effectively, is another question. 'Planned activism' as a first fundamental step in networking, seems incompatible with current efficiency-oriented bureaucratic discourse.

From this first comparison of networks and institutional configurations, their origins and characteristics, I may draw another tentative conclusion. Both institutional configurations and networks are the result of accommodations among social actors who recognize a common concern. Both lead to what one may call a collective agency, a capability on the

part of the social actors involved to appreciate problems, reflect, decide and act together. However, due to their flexibility and focus on learning, innovation networks, more than institutional configurations, would seem to provide a good starting point for the formation of soft platforms to tackle complex social and ecological issues (Röling , 1994). In practice, this is going to complicate platform processes because in many situations soft systems to manage natural resources or waste disposal or natural parks, will have to be composed of both government and private organizations, each of these tied into their own configurations and/or networks. The construction of soft platforms, therefore, will generally either entail the merging of existing configurations into a larger whole, or the deconstruction of existing ones in order to build a new one, more adequate to the present purpose. A condition for both, it seems, is insight into existing forms of social organization for innovation in order to design useful interventions to improve and/or try to rebuild them.

Another important issue to consider when discussing the adequacy of different types of configurations for innovation is that, historically, social forms emerge as a result the intended and unintended consequence of series of social interactions, often over periods of many years. More than the convergences, resource coalitions and communication networks, innovation configurations, both institutional ones and networks, are affected by collective design and strategizing by stakeholders. Hence, in their structure and operations they mirror the innovation theory their constituent actors had in mind and the subsequent historical developments that affected them. As a result, while all social forms relevant to innovation may possibly demonstrate a certain inertia when faced with changing circumstances, one may postulate that in the case of institutional configurations and long-established networks this is even more the case. In the next paragraph I will discuss this issue in more detail.

7.10 Mental models and the appreciative character of innovation

The *appreciative* nature of both networking and hence, the social organization of innovation is underlined by the use of words such as *relevant*, *improved* and *new*. These imply the use of a standard, a yardstick to measure efforts and results by. 'Relevant' means that somebody figures the social actors involved some practices to be relevant whereas others do not. Or it may mean that certain volitions, propositions or contexts are considered more 'relevant' than others. Developing 'improved' practices implies a competent performance which, measured by some standard, is better than the previous one. And 'new' means that this particular (series of) competent performances was not known yet to the actors involved. In theory, however, it might have been known to everybody else, i.e. to all except the ones they considered 'relevant'. As a result, 'relevant diversity' becomes an important issue in the study of complex theatres of agricultural innovation while in practice diverging views, partisan positions and conflicts over strategies are a common element. General consensus and harmony, however necessary they may be at a certain point in time, is probably the exception rather than the rule. And, to paraphrase Lindblom (1990), it might be the strongest impairment of all to innovative performance. Nothing worse than a contented network of social actors who agree on everything including the lack of relevance of all non members. The challenge to networking for innovation, therefore, must be sought in exposure to different views,

different options, different horizons. In other words, networking for innovation implies a search for *Utopia*.

Historically, the meshwork of social practices and social relationships predominant in a particular configuration of actors has developed as the intended and unintended consequence of series of planned interventions, often over periods of a hundred years or more. I have also argued that, probably more than other emergent social forms, institutional configurations and networks are affected by collective design and strategizing. In their structure and operations they mirror the 'models' their constituent actors had in mind and the subsequent historical development which affected them. And they will demonstrate structural inflexibility with regard to changing the way they operate. For example, as an illustration of the view on the role of science and technology vis-a-vis farming practice in the institutional configuration concerned with horticulture in the Netherlands we may describe the following incident.

> ***"You don't believe that yourself, do you?"***
> Attending a meeting with Dutch glasshouse farmers in the famous Westland Glasshouse District, I once listened to a deputy research director explaining how it is the researcher's job to produce agricultural knowledge, to be transferred to the farmer by extension, so that the latter may apply it on his or her farm. At some point during his speech, one of the farmers stood up and asked: "you don't believe that yourself, do you?" And he continued to explain that it could not be true that only researchers produce knowledge. At the research station including extension staff, he calculated, some 200 - very! - intelligent people are actively involved in generating agricultural knowledge. While on the other hand, at some 6.000 odd farms in his region, he said, some 25.000 intelligent people are engaged in experimenting, adapting and developing knowledge as well, so that they could run their farms and improve their outputs. What he expressed was a firm reproof of the official who, in spite of intensive networking in horticulture in the Netherlands (Grooters, 1990), still dared to present the linear model as the motor for innovation in their sector (Source: Engel, 1990b).

An example of the far-reaching consequences of such collective design decisions can be found in the Dutch newly formed IKCs, liaison bureaus between agricultural research institutes and the extension services in the Netherlands. By design they have been cut off from visiting farms and farmers, because, as the dominant view has it, they are to provide just a link in the chain from research to extension. And extension has the contacts with the farmers so why should they have these as well? The complaints about the functioning of the IKC, not surprisingly, vary from lack of practical applicability of IKC recommendations to lack of feedback on farmers' problems by the extension services to IKCs. In this case, 'linear model thinking' has caused a complete disruption of the existing interfaces between the specialists now working at the IKCs and the farmers. Some of these are inclined to maintain informal ties anyway but are sometimes heavily criticized for it (pers.comm., 1992).

It follows that the study of the social organization of innovation in agriculture should also include research of how configurational design and management variables affect collective and individual innovative performance at different levels. As a consequence, we may

postulate that *competent performance in agriculture is contingent upon advances in knowing, both practical and scientific, about the social organization of innovation.* The configurations social actors construct to enhance innovation in agriculture reflect the models they adhere to. If such models are not challenged regularly and modified in practice, they might become mental 'prisons' and innovative performance may lag behind. The scientific models I discussed in this chapter are no exception to this rule. Only empirical research and reflective practice should help to redesign and adapt them permanently to changing circumstances and as such, may help to avoid the adverse consequences of adhering to an outdated model for far too long. Consequently, the study of the social organization of innovation attains more than just scientific relevance. It contributes directly to agricultural performance through the implementation of increasingly well-probed organizational designs to enhance innovativeness. From that point of view, its present level of funding in many countries is no encouragement.

7.11 Off the 'exploratory path', back to design and intervention

In this chapter I have tried to demonstrate that a networking proposition may provide some initial ingredients for developing an action-oriented theory of social organization of innovation. Networking can in fact be seen as lying at the core of innovative social practice. A direct relationship may be argued between (collective) innovative performance and the quality of networking between relevant social actors. Also, I answered my first two research questions concerning the nature of innovative practice and the forms of social organization which emerge as a result. Consequently, I suggest our studies of the social organization of innovation should include inquiries into networking by relevant social actors as well as into the convergences, resource coalitions and communication networks which emerge among them. Also, I propose configurational analysis to bring into focus the more enduring structural relationships for innovation between relevant social actors. It provides a basis for debating the adequacy of leadership and coordination mechanisms in complex innovation theatres. Finally, my findings suggest that competent performance in modern agriculture is contingent upon advances in practical and scientific knowing with respect to the social organization of innovation.

Although still 'in statu nascendi', I do believe I have shown the potential of a networking approach for refreshing our thinking on innovation and strengthening the knowledge systems perspective. Also, I believe I have laid a foundation for developing a more empirically grounded way of designing useful interventions to improve innovativeness in complex agricultural innovation theatres. Therefore, in chapters eight and nine I will leave the 'exploratory path' and go back to design and intervention.

8. *Facilitating innovation: RAAKS, a practical methodology*

8.1 Introduction

In the last chapter I proposed a conceptualization of the social organization of innovation in complex innovation theatres, answering my first two research questions (Q1, Q2, par. 1.8). The approach I offer provides a way of understanding the social organization of innovation that does take into account human knowing in its individual, social and practical dimensions. Also, I believe it will help practitioners and researchers to generate a more comprehensive understanding of relevant issues in practical situations. Hence, for the scope of this book I considered my 'exploratory path' to end here (cf. 2.5). I conclude that the study of the social organization of innovation in complex agricultural innovation theatres should focus on networking among social actors from relevant practices and the convergences, resource coalitions, communication networks, institutional configuration and multi-actor networks that emerge as a consequence. My next questions have to do with designing a structured approach to improving performance in agricultural innovation in such theatres.

In the next paragraphs I will first address what I mean by improving performance in agricultural innovation theatres. Can a social and diffuse process such as agricultural innovation be influenced at all? If one sheds the ambition to arrive at a controlled management of agricultural innovation, as we already did, can anything be done at all to facilitate performance? My answer is yes, but...only when particular situations arise. I will argue when such is the case and what strategies are then conceivable (8.2). Next I will draw from my research and professional experience criteria an approach which aims at facilitating the improvement of innovative performance would have to comply with (8.3). After this, I will briefly describe the design process which led to a practical approach to studying the social organization of innovation (8.4). Then I introduce RAAKS as a methodology and show how it may fit the requirements formulated earlier on (8.5). Besides, I introduce a number of analytical perspectives or 'windows' from RAAKS briefly and discuss their usefulness within the context of participatory inquiry into the social organization of innovation (8.6). Finally, I formulate some preliminary conclusions and draw attention to a number of critical issues with respect to the RAAKS design (8.7). In chapter nine, a number of practical applications of RAAKS will be reviewed and its applicability in practice will be looked at.

8.2 Improving performance in agricultural innovation?

With the results of my explorations in mind I suggest the improvement of innovative performance in agriculture can be seen as improving networking as a social practice. Competent performance in agricultural innovation is contingent upon both the *quality of networking* among relevant social actors and the *choice of actors (and practices) whom to network with.* The first refers to the way in which relevant actors relate to each other to prepare, share, weigh and take decisions about volitions, propositions and contextual issues. It can be analyzed as a social learning process in which sense-making, coalition building and communication play a predominant role (cf. 7.9). The second point is more complicated. Particularly in view of the challenges agriculture faces today, the choice of *whom to network with* is crucially important. Networking means investing in a relationship, intensive sharing of ideas, experiences, communication and, generally, in mutual adjustment of ideas, strategies and practices among social actors. Therefore, this choice determines to a large degree the course innovation is going to take. Whether a farmer spends most of his or her time and energy on networking with colleagues and commercial advisers or on building relationships with government officials, naturally makes an enormous difference, even if it can not be said generally which of these two networking strategies will be most effective.

On the other hand something like a blue print for 'competent performance in agricultural innovation' does not exist. The appreciative nature of networking for innovation implies performance can only be judged against the standards constructed by social actors sharing a particular *volition* relevant to agricultural innovation. To ask whether the social actors in an innovation theatre network competently is unanswerable unless one specifies the standard their collective conduct is to be compared against. For example, by specifying food security, increased farm income, sustainable development, energy efficiency as general objectives for agricultural innovation. Such a volition may be expressed as a *mission* to be accomplished: it specifies objectives, target groups and technological options, so that measures of impact and effectiveness of innovation may be derived; also, it helps argue the relevance of certain social actors or particular social practices to the accomplishment of innovation objectives; when local food security is the prime interest of the social actors involved in innovation, export firms will not be viewed as relevant to their quest. If however competing in the world market is their aim, they definitely will. Similarly, tourism operators are generally seen as completely irrelevant to innovating farm practices. However, when it appears that small farmers may gain an important part of their income from attending 'agro-tourists' this situation may change dramatically. In order to assess the level of competence, innovative performance is to be judged in the light of a particular innovative volition relevant to at least some of the social actors in a specific theatre.

I conclude that in order to assess innovative performance both *volitions* and *networking* have to be studied. These are intrinsically related: networking acquires meaning in relation to a particular innovative volition or number of such volitions; volitions are void unless networking carries them into practice. This makes the assessment of innovative performance a fundamentally subjective exercise: unquestionable standards by which to measure it can not be formulated. At the very most, the innovative volitions of several

relevant actors may be recognized in the light of which innovative performance can be evaluated. Exceptionally, a broad consensus exists for a certain period of time as to the one general mission innovative performance is to accomplish. As we have seen before such a strong convergence might be as much an advantage as an impairment to innovative performance, depending upon one's point of view in a particular situation. Hence it is unwise to declare consensus the desirable state of convergence among social actors for achieving agricultural innovation. When investigating innovative performance, it seems advisable to uphold the notion of *relevant diversity*, i.e. to include different volitions representing the points of view and arguments different (sets of) social actors bring forward with respect to the desired direction of change in agriculture. I propose this criterion to guide our choice of actors as well our choice of relevant practices. Being an appreciative indicator, later on I will discuss the way it can be handled in practice.

Even if we agree networking quality and relevant diversity in innovative volitions, social actors and practices are standards competent performance can be measured against, we are still stuck with the question of whether it makes sense to try to intervene in a diffuse, social process like agricultural innovation directly. Generally speaking, my answer would be no. Innovation originates from interplay between social actors who perceive themselves as stakeholders in, or at least affected by, the developments in the agricultural sector. They can be trusted to seek out relevant partners to share ideas, information and experiences with, to probe volitions, propositions and contexts and to pool resources for the sake of implementing particular projects, if they see the need for it. Generally, they do not need somebody to tell them what to do. In such situations, one may say, the way innovation is organized socially is quite satisfactory.

Sometimes however, relevant social actors perceive the way innovation is currently organized as problematical and are willing to take action in order to improve it. This is the case for example, when governments decide to privatize agricultural extension and/or research or when national governments or donors decide to withdraw from supporting food crop production. In modern agriculture a constant strive for food (self)sufficiency and production efficiency has guided technological developments for decades. At this moment, with competing claims being increasingly made on agriculture, dissatisfaction among social actors with the way innovation is organized has increased considerably. In accordance with Kuhn (1962) for scientific practice, I propose such situations are the result of the inertia of social practices and structural forms relevant to agricultural innovation. Established networking practices and structural forms make it hard for social actors to adjust to new circumstances. Customary innovative behaviour may prevent them from spotting new opportunities and developing new vistas and technical options. To bring such impairments out into the open and to design measures to modify it seems a solid reason for concerted action on the part of relevant stakeholders. Its general aim would be to modify current networking practices and relevant structural forms to fit new demands and circumstances.

Two different strategies are then conceivable to improve innovative performance. The first is to aim at improved networking among social actors of relevant practices directly. It would be based upon an evaluation of networking as a social practice for innovation and seeks to formulate recommendations for improving its effectiveness within a particular social context. We could label such a strategy a *network improvement strategy*.

The second would aim at converting the existing structural forms relevant to agricultural innovation in such a way as to increase their adequacy from the point of view of new challenges perceived by relevant stakeholders. This one would require a more demanding re-configuration of existing innovative relationships, a *network re-configuration strategy*. In both strategies networking the quality of networking, the relevant diversity of volitions, the choice of social actors and the choice of relevant practices are to be subjected to debate. Also, at the root of both lies unease with respect to current performance and willingness on the part of important stakeholders to do something about it. The difference between the two is in the initial appreciation of the situation by the stakeholders: whether the experienced difficulties are seen as caused by ineffective networking practices which can be improved upon or, on the contrary, as the result of inertia of existing structural forms.

8.3 Structured inquiry into the social organization of innovation

What methodological criteria would have to be met in a structured approach which aims at bringing out the social organization of innovation and laying the foundation for designing strategies to improve it? Without claiming to say the last word about it, in this paragraph I will search my research as well as my professional experiences for clues with regard to the definition of appropriate methodologies for inquiring into the social organization of innovation in practical situations with the purpose of developing recommendations for improvement. Fortunately, I do not have to start from scratch. In chapter two I chose the knowledge systems perspective as a conceptual tool and soft systems methodology as an approach to action-oriented inquiry. In this paragraph I will first return to this choice and make some amendments to the two perspectives in view of their use for inquiries into the social organization of innovation. Then I will review my conclusions in 8.2 and extract additional issues. Finally, I will try to some up the type of approach I think would be needed in order to fulfil the requirements.

I conclude from the results of the 'exploratory path' in chapters 3 to 7 that the knowledge systems perspective has been a fruitful heuristic device to focus on the social organization of innovation. However, I also confirmed that this perspective does not offer a consistent theory to explain what can be observed. I had to draw in other theoretical contributions such as work on cooperation and networking for innovation (Moss-Kanter, 1983, 1989; Wissema & Euser, 1988; Box, 1990), on social actor orientation (Long, 1989; Long & Long, 1992), on the structure of organizations (Mintzberg, 1983), on social problem-solving (Lindblom, 1990) and a philosophical approach to the practical use of knowledge (Gremmen, 1994). This leads me to suggest one first requirement. *An approach to studying the social organization of innovation in practical situations may fruitfully apply a knowledge systems perspective yet would have to include additional theoretical perspectives in order to offer guidelines for explanation.*

Similarly, the choice for soft systems thinking has proved important. The appreciative and social nature of innovation as well as its emergent forms of human organization provide strong arguments in favour of looking at 'systems' as social constructs with arbitrary boundaries. As Röling (1994) points out, with respect to facilitating the emergence of forms of collective agency to tackle complex social and ecological issues such as natural

resource management, the same applies. My explorations have demonstrated convincingly that the study of the social organization of innovation from a hard systems perspective is a dead-end alley. The way innovation processes are organized is intrinsically interwoven with the way social actors make sense of the world, transform their intentions into actions and relate to each other socially. From this point of view there simply can not be one 'most effective way' to organize innovation. What we are left with is the possibility to initiate sensible, purposive discourse on the complex phenomena involved in the social organization of innovation: *a methodology for studying it should offer the possibility to engage in such meaningful discourse.*

I suggest a soft systems approach indeed offers a solid starting-point for engaging in discourse on the social organization of innovation. Its aim, to improve human performance through debate and reflection, coincides with what seems desirable and possible in the case of innovation. Its methodological design as a systemic learning process facilitates a participatory, situation-specific inquiry. The use of different ways to create images, including non-systemic ones, and constructing 'windows' for inquiry and learning makes it possible to include various theoretical perspectives. The soft systems methodology would have to be developed further, to include a more explicit reference to randomness and choice, relevant diversity of views, actors and practices and would have to pay explicit attention to social interaction for innovation and the issues of power and influence such entails. Therefore a greater emphasis on the use of *actor arrangements* instead of activity or input/output arrangements for creating systemic images is necessary. In short, one may say, *a methodology to study the social organization of innovation would have to be based upon 'appreciative systems thinking'*, a form of soft systems thinking more suited to the analysis of complex processes of social interaction and construction.

This is compounded by the fact that our methodology would have to serve the evaluation of inter-organizational behaviour instead of intra-organizational behaviour as is the case in most soft systems research. Between organizations, not only opinions and world views differ but these lead to differences in missions, cultures and power structures which might render the organizations incompatible to a large degree. Therefore, *participation of relevant actors in meaningful discourse* on the social organization of innovation seems even more important. Quality standards for communicative interaction would have to be high. Besides, the eventual implementation of configurational adjustment strategies would require at least a partial consensus among core actors. *The search for and negotiation of new or improved alliances for innovation would have to be an integral part of the approach.*

Returning to our argument from 8.2, the methodology we look for would have to contribute directly to the study of networking practices as well as emergent structural forms of organization for innovation. It would uphold relevant diversity in volitions, actors and practices as a standard for competent performance in innovation and would only be useful if and when a significant number of important social actors in a particular innovation theatre are uneasy with the way in which innovation processes are organized. This can be due to a critical experience or a shift in intentions on their part or, alternatively, a wish to anticipate upon changing circumstances. Due to the appreciative character of the social organization of innovation, the definition of the problem situation

given by those considering intervention would not necessarily be the only viable one, let alone the one which leads to viable solutions strategies. *The approach would have to combine the study of the social organization of innovation with a thorough analysis of the problem situation as it is brought forward by those initiating the study. The problem is part of the problem.*

As a direct consequence of our emphasis on active involvement of stakeholders, I may add that applying the methodology *would have to generate immediate, tangible results.* Only then the momentum in restructuring the social learning process for innovation can be maintained and the energy each of the social actors invests in the exercise can be justified. Results may be individual or joint actions, cooperation or communication strategies, shared reflections or commitments in terms of future actions or even just a debate which is perceived as useful by most actors involved. The more specific the outcome and the more active the involvement of relevant stakeholders, the more reason to believe that the social organization of innovation will indeed become modified as a result of the intervention.

In summary, the approach we look for would have to be an appreciative soft systems methodology, not unlike the participatory action-research methodologies presented by Foote Whyte (1991). The big difference between it and more traditional SSM and PAR approaches is that it would have to be suited to dealing with problematical situations in which no joint management structure is necessarily available. The most we encounter in the situations we study and operate in are sets of social actors who perceive some degree of interdependence. At every step of the way volitions and social relationships among actors will have to be made explicit and debated without pretending to achieve a strategic consensus always. This need, particularly when feelings of unease persist among stakeholders, I took as a starting-point for designing an approach to diagnosing and improving innovative performance: RAAKS, Rapid Appraisal of Agricultural Knowledge Systems.

8.4 The RAAKS design process: networking for innovating innovative performance

The design objectives which have guided the development of RAAKS from the beginning can be summarized as follows:
(1) the methodology is to help social actors probe the uneasiness they feel with respect to actual innovative performance and define a problematical situation in one or various meaningful ways;
(2) it is to help social actors articulate the way they presently organize themselves for innovation, so that the social organization of innovation can become subject to meaningful debate; and
(3) it is to help social actors define actions they consider useful to enhancing the process of innovation with regard to a common concern. Such actions might be forms of cooperation and/or communication directed at probing volitions, propositions, contexts in order to generate new or at least alternative solutions to well-probed problems.

The design process of RAAKS itself has been an exciting yet at times 'long and dusty' road. I will paint it with rough strokes of the brush. I trace it back to my experience in

the field with developing a *participatory diagnosis* technique. To improve the effectiveness of our extension efforts in the South of Colombia, we set out to design, test and implement a participatory method for diagnosing farmers' views, knowledge and indigenous solutions to problems in agricultural production (Engel, 1984). From Paulo Freire we had learned to use slides for the purpose of making farmers' views explicit by stimulating reflection and debate. At the time, in Latin America participatory research in social sciences was very strong. De Schutter (1983) for example, synthesizes the experiences of many and demonstrates how participatory research is a viable and reliable methodological option in adult education. The *participatory action-research* tradition, articulated by Foote Whyte (1991) continues to expand this body of knowledge. Our 'participatory diagnosis' was quite successful in the field (Engel, 1984) and proved to be a tool for improving extension performance and the institutions' capacity to listen to farmers and rural women seriously (Lopera et al., 1985; Engel, 1991).

Back in the Netherlands, from extension and farmers' knowledge I became increasingly fascinated with the social organization of innovation as a whole. With Niels Röling and Bertus Haverkort we took it upon ourselves to further develop the knowledge systems perspective. The International Course for Rural Extension, at the International Agricultural Centre in Wageningen provided the context in which to put it into (training) practice. Besides, the programme for international development in extension of the Ministry of Agriculture, Nature and Fisheries provided opportunities to apply our ideas in national and international programmes. In 1986, my first rather naive attempt I labelled *Agricultural Knowledge Systems Analysis: Q(uick) and D(irty) Inventory Exercise*. It aimed at making an inventory of interactive relationships between different institutions concerned with agricultural development. At first, it was directed at introducing the concept of Agricultural Knowledge and Information Systems in international training. It generally provoked heated debates on crucial issues with regard to the social organization of innovation. For example during the 1986 'Nol in 't Bos' workshop at Wageningen, concerned with research-extension linkages in the Netherlands. However, because of its failure to support a more systematic analysis it often left participants more intrigued than satisfied. Then the ISNAR RTTL Study provided us with an opportunity to study linkages between research and extension in more detail. A first attempt to conceptualize the way in which research and extension organize themselves for technology development was one of its results (Kaimowitz et al., 1990). My participation in the design and implementation of a field methodology for this comparative study (Engel at al., 1989), opened my eyes to the complexities and appreciative character of the social organization of innovation.

In 1989, together with Stephan Seegers, we made a first more formal attempt to create a methodology. It was formulated for use by senior extension specialists from the Ministry of Agriculture, Nature and Fisheries of The Netherlands who needed a method to support strategic planning of interventions in developing countries. We thought of it as *RAAK S/N: Rapid Appraisal of Agricultural Knowledge Systems or Networks*, a practical approach to knowledge systems analysis. It benefitted from the Department of Communication and Innovation Studies' Knowledge Systems Research Programme and ISNAR's Research/Transfer Linkages Study in which both of us participated actively. It stipulated (1) a chronology of activities, (2) fields of analysis, which suggesting particular issues and questions to guide the inquiry, and (3) tools to support the analysis around particular issues within a field of analysis. Besides, the design defined a number of 'core

concepts' for theoretical consistency. In order to stimulate reflection and debate it offered a number of 'hypothetical statements', basically relationships between 'core concepts' reflecting the 'state of the art' of scientific inquiry into the social organization of innovation. Most of these statements were written in the *if...then...* rule form for easier interpretation. Some examples are given below.

> ***Some examples of 'hypothetical statements' in version 2 of RAAKS:*** IF (perceived) interdependence is low THEN linkages are not sustainable; IF actors in the AKIS have a shared conception of the system, use a common language and have a common sense of mission, formulated and agreed upon subordinate goals THEN structural linkages and integration are facilitated (after: Rogers (1986), Blum (1990). IF systems do not exhibit high levels of integration THEN they are not successful at regularly making available relevant new technologies (after: Kaimowitz et al., 1990). IF linkage mechanisms are dependent upon insecure or temporary resources THEN the sustainability of the integration is low (after: Engel, 1990a). IF the system exhibits disjoint reward systems and incentives THEN the knowledge system components will reduce their synergy (after: Röling, 1988). IF positive external pressures from national policy makers, foreign agencies, farmers or the private sector are lacking THEN institutions will generally follow internal dynamics which promote poor performance (after: Sims and Leonard, 1990);

As illustrated, these statements were derived from hypotheses developed by trustworthy sources. We intended them to serve as a stimulus to meaningful debate on the current situation, and, if confirmed by the team during the appraisal, to serve as a basis for formulating conclusions and recommendations. To our surprise, they provoked Peter van Beek, friend and colleague from Australia and otherwise a very enthusiastic participant in and supporter of our efforts, to label us *typical Dutchmen who think they can prescribe what's best for everybody*. At the time, it puzzled us because we still believed these statements offered what we thought of as an *objective account of what has proved successful in agricultural innovation* - and what was wrong with innovation in Dutch agriculture anyway? Our experiences in training extension consultants and managers however, confirmed Peter's view. Even if our intentions were the opposite, as a result of being exposed to such 'nuggets of scientific wisdom' participants in our courses forgot to use their own knowledge and converted into 'technology users' instead of knowledge creators. Or, on the contrary, rebelled so much against our 'normative stance' that they dumped the methodology altogether. We owe to these experiences our discovery and integration with 'soft systems thinking' (Checkland, 1989).

Version 3 in 1990 marked this turning point. This version of the manual on what had now come to be known as *RAAKS: Rapid Appraisal of Agricultural Knowledge Systems* was prepared with Ab de Groot and Stephan Seegers. The chronology, fields of analysis and tool box survived, but the hypothetical statements were abandoned. Instead, we added an introduction to knowledge systems theory and knowledge management to provide a starting point for analysis and for designing useful interventions. Besides some experience in training and education, with this manual we gained our first practical experience in the field while using it for studying the Dutch Horse Husbandry Sector (1990) and research

and extension support to small grain producers in six countries in Central America (1992). We will discuss these experiences in chapter 9. Moreover, during an expert consultation at the Department of Communication and Innovation Studies in April 1991, experiences with RAAKS and its potential as a methodology were discussed among a group of about 20 Dutch knowledge management and development specialists, some of which had gained experience with RAAKS in their jobs. The consultation confirmed our being on the right track yet called our attention to a number of issues which deserved attention:

> ***Some suggestions from the RAAKS Expert Consultation 1991:***
> RAAKS is not necessarily rapid, it is a concentrated effort of many experts at the same time but not necessarily within a brief period of time; RAAKS could be the beginning of a longer research trajectory into the functioning of the agricultural knowledge system; the quality of the RAAKS team is essential, selection of team members has to receive a lot of attention; being selective in the choice of social actors to participate is essential, one should not involve too many for the exercise to remain manageable; RAAKS is effective as a means to stimulate reflection upon the social organization of innovation, to identify constraints and opportunities; its analytical value is to be improved, it raises many questions yet does not help sufficiently to answer them; the manual provides good tools for quantitative assessment of linkages; it does not provide adequate tools for qualitative assessments on key pieces of information, key decisions and (mal)communications; RAAKS is suited for both open-ended and closed problem situations; flexibility in managing the internal communication process, in the use of complementary analytical perspectives and in the choice of instruments is essential; RAAKS' focus on the intentions of actors is crucial, a 'mission' in agriculture is never hard; the terms of reference for the RAAKS team should be studied in detail as part of the exercise; too much of a focus on institutional consensus has to be avoided; it might be dangerous to innovation; RAAKS teams should carefully establish relationships with stakeholders before starting the exercise; beware of cultural biases, let local teams redesign their methodologies; assumptions behind the approach must be made explicit; structural aspects get more attention than social processes do; offer a rich menu from which choices can be made rather than a method which prescribes what to do exactly, creativity on the part of the participants comes first; power and governance need to become a central focus of attention in RAAKS; RAAKS is not 'top-down' nor 'bottom-up', it is and should be 'centre-out'; RAAKS can only be effective when a problem is felt by important social actors; RAAKS can not do everything, keep it focused, strengthen its support to designing interventions, field test and develop it further.

One of the elements from the expert consultation which really bothered me was the apparent contradiction between the RAAKS' effectiveness in bringing out relevant issues and its weakness in supporting the search for explanations. It coincided with criticisms formulated by colleagues such as Leeuwis with respect to the tension between the KIS perspective's nature as a heuristic tool and its (mostly implicit) pretensions of providing an explanatory theory (see par. 2.4). In fact, I agreed we even lacked a clear definition of what, exactly, we were studying with the help of RAAKS. We did not have an exact definition of what our object of inquiry was. In those days we talked about 'inventorizing

the actors in the agricultural knowledge system' as if such a system in fact existed. Of course, we did not really believe it did in a strictly ontological sense. But I, at least, had not fully mastered the idea of knowledge systems thinking as an 'epistemology' either. Besides our formative experiences with RAAKS in the Netherlands (i.e. Engel and Den Bakker, 1992; Den Bakker et al., 1993) and in international training, the often heated discussions with friends and colleagues from the sociology and applied philosophy departments of our university helped us to clarify ourselves. It stimulated me to include a more 'ontological' search into my studies of phenomena related to innovation and its social organization. The result of it I have presented in chapter 7.

Early 1992 I felt confident enough to expose RAAKS to the critical scrutiny of graduate students. This led to the first practical graduate course on RAAKS. With version 3 of the manual, case studies by graduate students and background materials were used and experienced professionals were actively involved as resource persons. Version 4 of RAAKS was prepared later this same year. With Monique Salomon, an anthropologist from Nijmegen University, we redesigned the approach and manual in accordance with the lessons we drew from field experiences, the expert consultation and the evaluation of the first course on RAAKS. We emphasized team building and the quality of information gathering and communication. The chronology, fields of analysis and tool box proved the 'pièces de resistance' of RAAKS. We complemented and adjusted them and put them in a more (inter)playful mode. The fields of analysis became 'windows' upon the world to underline their partiality and role as 'torch lights for bringing into focus particular relevant issues' rather than as comprehensive theoretical perspectives which help explain everything. The complementarity and the possibility to make a choice between them was emphasized. Like Chambers (1992) we started to think of the 'R' as representing 'Rapid or Relaxed'. We found both (relatively) rapid and more in-depth studies could usefully apply the RAAKS chronology, windows and tools. The lengthy introduction on knowledge system theory was cut down to a minimum. This was mostly because, despite all our efforts to effectuate the contrary, for researchers the theory included in the manual still seemed to function as a straightjacket. Its consistency helped create focus yet obstructed creative thinking and the use of personal experiences and insights. to compensate for lack of consistency we improved the windows to reflect a particular analytical perspective more accurately.

The possibility to shove the theory to the background dawned upon me for the first time when, due to time constraints I was forced to introduce RAAKS to a group of 15 Central American in only one day before entering into a practical field exercise with them. It worked marvels. The high quality of the group had a lot to do with this but also the absence of the straightjacket which stimulated the participants to draw upon their own intellectual and practical insights to perform well. The result was a more flexible application, a greater effort to redesign analytical tools and more of a learning as against a research experience. The fourth version of the RAAKS manual reflected our increased confidence in being able to apply the knowledge systems perspective without extensively introducing it as a theory and to rely on interactive group learning, choice and variation of different analytical perspectives to produce valuable results. In order to effectively create such 'interplay' in practice, we had to pay a lot of attention to facilitating communication among participants, and between participants and stakeholders during RAAKS. We had understood that the quality of interactive learning was directly linked to

the quality of the outcome of the RAAKS exercise as a whole and, what is more, we had learned to guide this process more adequately. And we had understood in a very practical manner that for this type of research, conceptual consensus might be among the most powerful impairments to innovative thinking. Lindblom's reflections on the impairing influence of knowledge, as well-probed and agreed upon beliefs (cf. paragraph 7.6), proved extremely relevant to the facilitation of innovative thinking on innovative performance as well.

From the moment we started to integrate RAAKS in university education, national and international students became a main driving force behind its development. Their enthusiasm in trying (parts of) it out under a variety of circumstances in different countries, cultures and for different purposes initiated a cascade of relevant experiences which we could hardly manage or even monitor adequately. Applications of RAAKS outside agriculture contributed greatly to exposing flaws in its design, particularly as a result of our encounters with hard technical engineering practice during studies into the social organization of innovation with respect to the introduction of photo-voltaic energy and problem-solving in the transportation sector in the Netherlands (Engel and Den Bakker, 1992; Den Bakker et al, 1993). Continued encouragements and suggestions by many colleagues both in the Netherlands and abroad helped enormously as well. In hindsight perhaps, RAAKS itself would have been one of the best case studies to demonstrate what networking means for innovating our practices.

In the next paragraph I will present the design of RAAKS as it is now, based on a paper we presented to the AFSR/E Conference at Montpellier, November 1994 (Engel & Salomon, 1994). If the enthusiasm we have encountered among so many colleagues all over the world is any indication, networking and development will surely continue.

8.5 RAAKS: an approach to facilitating the improvement of innovative performance in agriculture

RAAKS is designed as a participatory action-research methodology to bring out relevant issues of social learning for innovation and to design strategies for improving it in practical situations. Not surprisingly, RAAKS is built around particular intentions, *I*. Besides, it includes a procedural design, *P*, and an analytical design, *A*. In principle, $I + P + A$ make RAAKS as a soft systems methodology, *M*. In the following I will first clarify the intentions behind RAAKS. These mirror the considerations expressed in 8.2 directly. Interventions in complex innovation theatres make sense only if a significant number of relevant social actors feels uneasy with current networking practices and relevant structural forms and is willing to reflect upon these to formulate what possibly can be done about it. Next, in this same paragraph I will introduce RAAKS' procedural design. It outlines the basic steps and issues to be addressed for a soft systems inquiry benefitting from experience with (rapid or relaxed) rural appraisal and participatory action-research. Finally, in the next paragraph (8.6), RAAKS' analytical design will be presented. It specifies the windows proposed in RAAKS to study the problems felt, the social organization of innovation and to suggest potentially useful interventions to improve it.

I, P and A are separated for the sake of presentation. In practice, to separate them means to affect the methodology fundamentally. This is not to be understood as a claim that the intentions underlying the RAAKS design could not possibly be achieved with other means. It just indicates that in the design, intentionality, participation and object of inquiry are mutually dependent. To do away with one means to affect the others to such an extent that another methodology is the result, not RAAKS. For example, to do away with the participatory character of *P* and insert RAAKS windows into a more traditional field research design may be extremely interesting but it does not provide a context for participatory action-research and as such will not affect the local theatre the way RAAKS might have. Nevertheless, one of the underlying principles of the approach is that local teams may specify and adapt both I, A and P to circumstances by specifying and combining elements of RAAKS differently. I will come back to this apparent contradiction in chapter nine when I discuss the adaptability of RAAKS to different conditions in greater detail based upon a number of concrete experiences with its use. Also, for more details on the management of the RAAKS process itself, the team work, the exercises and tools I refer to the manual (Engel et al., 1994).

RAAKS' intentions and underlying principles (I)

RAAKS, rather than focusing attention on concrete solutions immediately, intends to help social actors study and suggest improvements in the way they have organized themselves to achieve agricultural innovation. It emphasizes *strategic diagnosis*, an appraisal of constraints and opportunities in order to jointly define useful strategies for improvement. Central elements are team work, focused collection of information, group discussions, qualitative analysis and strategic decision-making. A very important characteristic of the approach is that farmers, rural women, consumers or other target groups, are considered stakeholders and *sources* of relevant knowledge and information. RAAKS aims at two types of outcomes: a more comprehensive understanding of the social organization of innovation in a particular situation and interest on the part of (some) social actors to implement well-probed actions to improve upon it. In RAAKS, three different yet intertwined learning processes are combined to produce these outcomes: first, a joint inquiry by both team and stakeholders into the social organization of innovation with respect to a common concern; secondly, contrasting the findings from analytical perspectives which help focus on relevant ideas and events from different angles, creating a tension between different relevant and equally valid interpretations of the same situation; thirdly, a task-oriented path that leads the participants from analysing and interpreting a situation which, in the eyes of at least some of them, is problematical to designing possibly useful solutions.

(1) Joint inquiry into the social organization of innovation

RAAKS focuses on the performance of social actors as innovators of their own practices. Its starting-point is networking: what social actors consistently do in order to seek confirmation and/or adaptations of their practices is to seek, build and maintain relationships with selected other actors. Such networking efforts lead to more or less stable patterns of relationships or networks, some of which are particularly relevant to agricultural innovation. RAAKS helps social actors identify relevant networks and appreciate their role and relevance to the effectiveness of their search for agricultural innovation in concrete situations. Given the complexities and judgemental issues underlying complex innovation processes, RAAKS is designed as a 'soft systems' methodology (Checkland &

Scholes, 1990). It recognizes the appreciative character of the models we construct to study the world and is designed as an iterative inquiry among stakeholders. RAAKS helps to focus on relevant issues, offers instruments for gathering, organizing and interpreting information on relevant ideas and events as well as guidelines, techniques and exercises to support interactive learning. Relationship building, participation, communication and qualitative research are central to the implementation of RAAKS.

(2) Multiple perspectives: offering a choice of useful windows
The social organization is so appreciative and so many relevant strands of knowledge available to interpret it, that trying to formulate one model to represent it adequately in the eyes of everyone, is counterproductive. Instead, RAAKS is designed to include a variety of analytical perspectives or 'windows' from which research teams can choose and adapt specific ways of inquiry. Each of the windows originates from a different analytical perspective, draws attention to particular issues and relationships, has been developed and tested in field research, by others and/or ourselves, and has been chosen and (re)designed by us to fit an action-oriented methodology. Also, each of the windows has been equipped with one or a number of 'tools' to gather and organize relevant information. The purpose of offering such a 'palet' is to enable participants in a RAAKS exercise to create 'in situ' several distinct yet equally pertinent mental images to stimulate debate and reflection with regard to relevant ideas and events, rather than to attempt building one consistent model of the whole. This way RAAKS provides social actors with the possibility to do a 'quick scan' from various angles. The 16 windows currently offered by RAAKS will be discussed in detail in 8.6. This list is by no means exhaustive. On the contrary, being a participatory action-research methodology researchers and participating actors are encouraged to propose modified or additional windows and to design new tools of inquiry. However, our research suggests these particular windows to provide a team of researchers with a useful starting-point.

(3) Social learning: organizing ourselves for innovation more effectively
RAAKS focuses on problem appreciation and diagnosis, on the basis of which measures can be suggested for facilitating innovative interaction and improving the social organization of innovation. It is felt that just studying the social organization of innovation is not enough. Strategies are to be devised to overcome impairments, and to create opportunities for improvement. Therefore RAAKS is designed as a participatory action-research methodology. New knowledge about the social organization of innovation in a particular theatre is generated through joint learning among RAAKS team members and stakeholders in innovation. This interaction between stakeholders and researchers-facilitators is not uncommitted: its explicit purpose is to come up with well-probed suggestions for improvement.

The *operational objectives* for the use of RAAKS have been formulated as follows:
(1) to identify opportunities for intervention aimed at improving the way social actors are organized to achieve the type of innovation they are after;
(2) to create awareness amongst relevant social actors, such as managers, policy makers, producers, traders, researchers, extension workers and representatives of other (target)groups, with respect to the impairments and opportunities which affect their performance as innovators;

(3) to identify (potential) actors who (may) act upon and effectively remove certain impairments or make use of the opportunities identified previously.

The second objective is singularly important. Careful preparations are to be made to guarantee close collaboration. The RAAKS team might include social actors familiar with the situation as well as research-facilitators familiar with RAAKS as a methodology. Its number does not normally exceed four or five. A preparatory workshop may be held to familiarize the team members with each other and with the methodology. The relationships with stakeholders and their participation are to be prepared and managed carefully. RAAKS offers exercises to help develop team building, communication and joint learning among team members. Also it provides support in the development of interview skills and the planning and management of workshops.

This third learning process in RAAKS is task-oriented. It aims at creating one or various convergences among relevant social actors so that decisions can be taken about strategies to be followed. In order to support such task-oriented debate among team and participants, RAAKS offers specific windows to help construct a synthesis of the problem situation and one of the social organization of innovation as a whole (par. 8.6: A5, B8). Just as some of the other windows these make use of *actor arrangements* to help participants link particular missions to relevant stakeholders and to point out dominant relationships. Generally, the debate leads to a shared definition of the situation as well as convergences among (subsets of) stakeholders with respect to priority problems which affect successful innovative performance. This line of inquiry is necessarily more *exclusive* than the other two (joint inquiry and multiple perspectives). These are more open-ended including all that seems relevant at a certain point in time in the eyes of one of the participants. However, in order to arrive at a synthesis, less relevant volitions, options and conditions are to be left out, if not eliminated altogether, decisions have to be taken to choose the most widely supported interpretations of events and ideas, etc. To narrow down the scope of the inquiry does not mean to aim at consensus necessarily. If so, participants might agree they simply do not agree. However, they would also have to answer the question whether such a lack of consensus represents a serious impediment to competent performance in innovation of (some of) the social actors in the theatre. If so, they might have to reconsider, if not, all may happily go their separate ways. An example of such a situation is given below.

> ***Appreciation and debate, a foundation for inquiry into the social organization of innovation:***
> The Netherlands' agricultural system today, according to the point of view one assumes, may be qualified as 'a very successful export-earning whole' or 'a danger to sustaining life in the low lands'. We have argued that such differences in points of view are frequent and, what is more, may be vital to the community's capacity to innovate its practices. Rather than to suppress them, they are to be recognized and put to use in the debate on useful interventions and accommodations among stakeholders. Naturally, a RAAKS exercise initiated by those who conceive the problem in the social organization of innovation as 'decreasing competitiveness' will formulate their terms of reference to the RAAKS team in a completely different way from those who feel 'humans are an endangered species'. Yet, both most

probably need each other to construct economically, socially and ecologically sustainable innovations.

In order to ensure active participation of relevant social actors and a good chance of achieving convergence, at least as far as understanding the current situation is concerned, it has proved important to consider the establishment of a *steering committee* of relevant stakeholders. The selection of the members of such a committee is of course a very sensitive matter. However, if a relatively non-partisan, or balanced multi-partisan committee can be appointed it provides the exercise with additional credibility in the eyes of other relevant social actors and may help to induce more active participation on their part.

Chronology of activities: a step-wise procedural design (P)
After a preparatory phase which includes team building, getting acquainted with the methodology and building relationships with relevant stakeholders, the actual RAAKS exercise consists of *three phases*:

A. Problem definition and system identification;
B. Constraint and opportunity analysis;
C. Policy articulation/intervention planning.

During each phase, specific research objectives are pursued and a different set of windows is selected for the gathering, organizing and interpreting information and for the presentation of results. Teams may decide to modify windows or construct additional ones to adapt the analysis to the specific issues and the situation at hand. Each phase emphasizes different research objectives. During phase A, the most important one is to define the problem and to identify relevant social actors, issues and environmental factors. Among other things, this implies making a choice as to who, initially, is considered part of the 'soft system' and who is not. In phase B, the RAAKS team and actors formulate, analyze and prioritize constraints and opportunities for improving innovative performance. This means studying in depth several issues relevant to assessing the present effectiveness of the social organization of innovation. During phase C, the main issue is to articulate strategies, to plan concrete actions for improvement and to negotiate commitments.

The tasks to be planned and implemented during each phase can be summarized as follows:
(1) To debate, specify and agree upon the research objectives,
(2) To debate, choose and further operationalize relevant windows and/or to add new ones,
(3) To use these windows to gather relevant information through (group) interviews and from secondary sources,
(4) To elaborate field reports,
(5) To integrate ideas, issues, information through group discussions and
(6) To elaborate a synthesis report to reflect important issues, information gaps and tentative conclusions.

Besides, at the end of each phase a *workshop* is organized with (representatives of) relevant social actors and target groups. The purpose of the workshops is to return the

information to the stakeholders in order to enable these to debate, complement and/or amend the research findings and to participate actively in the learning process. The field reports are made in order to share and discuss ideas and information among team members, synthesis reports are made to share ideas with stakeholders during the workshops. For that reason, for the latter use is often made of (system) drawings, tables and brief statements rather than lengthy descriptive reports.

Of course, the phases can not be separated strictly. Sometimes elements are brought forward to an earlier phase, sometimes an analysis from an earlier phase is repeated in more depth in the next. Also, circumstances may oblige researchers to collapse the exercise into less or break it up in more phases. Nevertheless, our experiences indicate that the planning of field work for RAAKS in three phases provides a useful starting-point. In the following we briefly sketch the contents of the three phases. In 8.6 we provide examples from our field work and in chapter 9 we will discuss in more detail the results of some of the experimental applications of RAAKS.

Phase A: Problem Definition & System Identification: Windows are available to guide a preliminary inventory of relevant social actors, an inquiry into the definition of the problem situations, a review of different actors' views on problems and desired development, and an analysis of environmental constraints. The latter includes those factors such as agro-climatological, socio-cultural and economic ones which are considered non-manipulable within the scope of a particular innovation process. The outcome of phase A is a first approximation of the ways in which social actors currently (inter)act to innovate their practices, showing salient bottlenecks and possible chances for improvement. RAAKS offers the use of a system drawing exercise to support such a synthesis (see figure 6).

> ***Reopening the discussion on the use of bio-ethanol as transport fuel (an example of the results of phase A):***
> In the Netherlands, the complex discussion on the advantages and disadvantages of the use of bio-ethanol has become stagnated and polarized. After the appearance of a balanced report of the Scientific Council for Government Policy which recommended an experimental project on a practical scale, for some time nothing happened. One of the industrial stakeholders decided to ask the WAU to apply the RAAKS methodology to try to reopen the discussion and to develop ideas for concrete follow-up activities. A choice was made not to address the national level debate, but to focus upon the North of the country where the problem of developing alternative farming activities is mostly severely felt. The research team was formed together with an actor of regional importance: the Van Hall Institute for higher agricultural and environmental education at Groningen. The team focused on the discussion process itself, interviewed key actors and identified hot topics, communication practices and relationships. Over 20 stakeholders participated in the first workshop, including farmers, industrialists, environmental activists and specialists from various government departments. The team proposed the search for viable alternatives like bio-ethanol had stagnated because of (a) lack of communication between three different sets of actors each focusing upon different priorities (see figure 6), (b) the fact that the discussion had been dominated by experts, rather than social stakeholders, and (c) a certain competitiveness amongst

actors with regards to the specific solutions each of them propagates. The workshop recognized these reasons and suggested additional political and technical reasons to explain the situation. It became apparent that enough support could be mustered to initiate actions towards establishing a collaborative experimental project for testing and evaluating the production and use of bio-ethanol on a practical scale. Further action-research into the most effective way to do so was proposed (Van Weeperen et al., 1994).

Phase B. Constraint and Opportunity Analysis : During the second phase the team members go into the field to gather information on the social organization of innovation more systematically. Windows are available for the study of impact; actor characteristics and linkages; knowledge networks; task performance; and coordination and communication between actors. The actual choice of windows the team makes depends upon the problem situation and the priorities expressed by social actors during phase A. The outcome of phase B is a more detailed picture of how different networks of social actors interact, the issues prominent in their debates and the way they coordinate their activities or fail to do so.

Horse husbandry in the Netherlands (an example of the results of phase B): The first comprehensive application of RAAKS was in the Horse Husbandry Sector in the Netherlands in 1990. The then recently formed Knowledge and Information Reference Centre of the Ministry of Agriculture, Nature and Fisheries was interested in diagnosing the way in which knowledge and information was generated, exchanged and used in the horse sector, in order to be able to better (re)define its role in facilitating effective knowledge management. A general conclusion, recognized by all actors involved was that in fact no 'Horse Husbandry Sector' exists in the Netherlands. Three quite separate clusters of actors, called 'blood lines', exist: one dedicated to horse racing, one to horse breeding for export and one to facilitating recreational horseback riding. For obvious reasons, actors in each of these segments formulate the mission for their innovation activities quite differently. Inter-connectivity, knowledge and information sharing and communication are much stronger within the 'blood lines' than between them. It became clear that the recreational cluster, though the largest in number of entrepreneurs and beneficiaries, had only a marginal influence on the agendas for breeding, research and extension and that it could benefit from organizing itself better and building stronger alliances. The breeding line, on the other hand, could benefit from stronger ties with both extension and education, even though its linkages with research were very strong. Sector knowledge management was found weak particularly with regard to farm management economics and marketing. Even though available within the sector (mostly with the horse racing and export actors), other entrepreneurs had difficulty gaining access to it. It was recommended the Reference Centre would take it upon itself to improve this. Another observation was that, due to lack of a direct relationship between research and the different groups of clients and/or beneficiaries of the horse sector, economic support for and feedback to research was weak (Engel et al., 1990).

***Phase C. Articulating Strategy/Action planning*:** during phase C alternative strategies or actions are formulated and debated. Support among social actors for one or the other is looked at. Three windows support the identification of (1) useful strategies to overcome impairments or act upon new opportunities, (2) the relevance of each of the social actors for enacting such strategies, (3) the support they are willing to give to such strategies. Generally, these strategies concern proposals for improved cooperation and/or communication strategies. However, specific organizational, training or documentation and information proposals may arise as well. The outcome of phase C is a commitment on the part of (some of the) stakeholders to follow-up on (some of) the recommendations.

Basic grain production in Central America (an example of the results of phase C): The EEC-sponsored PRIAG Basic Grains programme of 6 Central American countries aims at improving the relevance and impact of research and extension for mostly small grain producers. RAAKS was used as an instrument to generate recommendations for action. Teams were selected and trained to perform RAAKS exercises in selected grain growing regions in their countries. The analysis underscored the importance of understanding diversity in the social organization for innovation: often, two entirely different subsystems were seen to exist, 'A' whose beneficiaries are solely subsistence farmers, and 'B' whose beneficiaries are subsistence producers who also sell part of their produce. The problems faced by these two subcategories of producers vary widely, as does the way in which they acquire and share their agricultural knowledge. In fact, the former generally have not been considered as beneficiaries of research and extension programmes at all. As a consequence, technical packages have never been developed to fit their needs and information reaches them mostly indirectly, through contacts with B farmers or sometimes, local traders. These in turn receive most of their information through representatives of private multinational companies who sell inputs and/or services. Public institutions often play a secondary role in providing grain farmers with technical recommendations. Particularly among category A farmers knowledge on basic issues like improved varieties and their adaptation, integrated pest management, cultivation methods, etc. is relatively poor. And so is the familiarity with their practices and circumstances of researchers and extensionists. However, also among category B farmers adoption of improved technologies is often partial due to lack of credit, difficult access to marketing channels, etc. Another feature frequently noticed by the teams, and recognized by the different stakeholders, was the lack of coordination or even disarticulation between public, private and non-governmental institutions with regards to attending to the information needs of grain producers. Recommendations ranged from re-orientating research and extension policies, to establishing documentation and information centres, to (re)activating of a number of inter-institutional coordinating mechanisms and stimulating the organization of farmer study clubs. A calling feature of the studies in the six countries was that each of the analyses demonstrated particular characteristics related to the social situation in the region and country itself, such as the active involvement of elected municipal authorities in Nicaragua, the recommendation to reinforce institutional intervention and coordination in Honduras, and a reflection upon the possibilities for agro-tourism in Costa Rica (PRIAG MSICA Workshop II, September-October 1992).

RAAKS follow-up: besides a more comprehensive understanding of the problem situation and the social organization of innovation among team members and stakeholders, RAAKS is to lead to an increased awareness among stakeholders with respect to the things each of them can actually *do* in order to enhance innovative performance. Therefore RAAKS emphasizes problem appreciation, diagnosis and eventually the articulation of strategies and strategic commitments. The preparation and implementation of specific projects, on the basis of such commitments, is as yet not included in RAAKS. Such a follow-up is entirely in the hands of the social actors who were involved in the process. This has various advantages in terms of non-intervention by outsiders (RAAKS-facilitators) in the implementation of the plans, and the freedom for social actors to modify, time and execute agreed upon strategies and/or actions as they see most convenient. Lack of visibility of RAAKS results is a less favourable side effect. Also, if no management structure has been established one may rightfully ask whether the improvements will ever be implemented at all. However, being the social organization of innovation as it is, appreciative, largely self-guiding and social, one may object to such an argument that social actors will in time implement changes, if and when they continue to perceive the advantage and can muster a strong enough alliance of actors to do so. At the moment, RAAKS does not pretend to achieve more than *discursive* commitments, as Rap (1992) puts it. Commitments in words rather than deeds. I am aware that this might be perceived as a weakness in the approach. It might however be one of its main assets in practice. I will come back to this issue at the end of the next chapter when reviewing the results of our field work.

8.6 RAAKS' analytical design (A): windows to study the social organization of innovation in practical situations

The windows currently offered with RAAKS are the ones which survived the at times turbulent developments over the last eight years. They have proved useful under different circumstances. I intend to argue the usefulness of these windows in a formal manner. I propose two criteria:
Firstly, a window may be called useful when it helps the researchers bring into focus the social organization of innovation as the object of inquiry, not some other phenomenon. Such would be the case when the window sheds light on the emergent practices and structural forms which evolve as a result of the efforts social actors make to innovate their practices. In line with Suchman (1967), I label this the *validity* criterion because it relates to whether the window does what we expect it to do. Within the context of a soft systems study into the social organization of innovation, *a valid window helps researchers focus on relevant practices and structural forms of social organization for innovation.*
Secondly, an instrument only becomes useful within the particular context shaped by a methodological approach to research. The same (valid) instrument may be useful as an instrument of inquiry for gathering quantitative data, yet may be useless for qualitative inquiry. The opposite case might be even more frequent. On the other hand, some instruments might be useful in a variety of research contexts. I will refer to this as the *applicability* criterion. Generally speaking, an applicable window fits a particular research context well. As I am interested mostly in the research context created by the use of a participatory soft systems methodology, RAAKS, I may rephrase this criterion to read: *an*

applicable window helps participants construct (systemic) images to stimulate interactive learning in order to improve collective performance.

In the following I will discuss each of the windows suggested for a RAAKS exercise, focusing on its *design*, its *validity* and discuss its *use and applicability*. The windows are labelled A1, A2, B3, C2, in accordance with their (suggested) use during one of the phases of RAAKS. Figure 5 is added to visualize their use as part of the whole exercise.

It is clear that, even if all the windows could be considered valid and applicable, this by itself does not guarantee adequate RAAKS performance. This is due to the nature of innovation processes: in some cases, conflicting views have been noticed to obstruct progress while enhancing it others; also, consensus about the nature of the problem, in some cases, might be reason enough to suspect innovative impairment while in others it might help pushing ahead an adequate RAAKS exercise. To appreciate what is the case in a particular situation, the windows may help but can not replace individual and group skills of the RAAKS team and stakeholders in choosing workable conceptual and practical accommodations at each stage. In short, the application of RAAKS and each of its windows requires relationship building and communication skills, an inquisitive mind and creativity on the part of its participants. No procedure in itself can guarantee success.

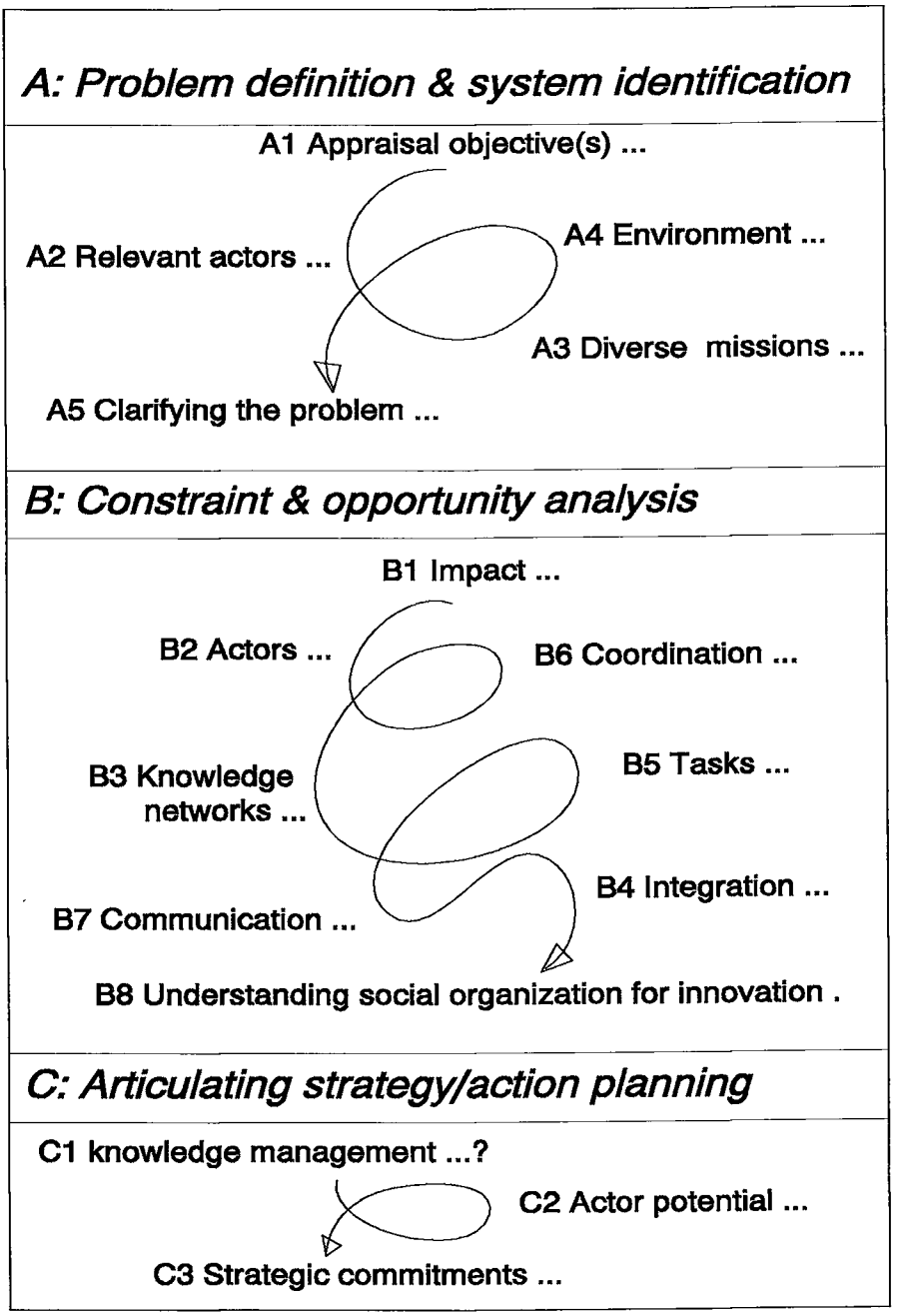

Figure 5: RAAKS: juggling with perspectives....

Window A1	**Redefining the objective of the diagnosis**
A terms of reference usually reflects the views of just some of the actors relevant to a particular innovation process. However important these may be, a critical reassessment of the terms of reference is necessary in order to determine a workable initial problem definition and objectives for the RAAKS exercise.	

Design: this window raises questions such as: *who declared the problem? Who thinks it is important? Who does not? Why?* Checkland's inquiry into the *ownership* of the problem proved useful: who holds (some of) the keys to solving the problems mentioned? This window requires great skill on the part of the team. Initiators of inquiries into the social organization of innovation do not normally see why they might have formulated the problem 'wrongly'. Nevertheless, the team needs to probe different views relevant to the purpose of the inquiry carefully. Their inquiries should aim at a rich picture, disclosing relevant diversity, rather than seeking a consensus at such an early stage in the exercise.

Validity: this window obliges the research team to make their own objectives part of the problem. Uneasiness on the part of (some of) the stakeholders usually reflects partiality in their appreciation of the situation. The window calls for the researchers to probe their views and arguments and to confront them with different views expressed by other social actors relevant to innovation. Examples of such views are 'farmers resist change, if only they would do what we say' or 'extensionists should not bother us with their comments, they should simply implement the recommendations we provide them with'. These lead to Terms of Reference which read something like 'to design ways to improve farmers' response to extension programmes' or 'to improve the effectiveness of extension'. Such partisan views make it very hard on the RAAKS team to pursue a balanced inquiry covering all relevant practices and social actors in the theatre and not just some. A critical and interactive inquiry into the ideas and events which lay at the root of such views eventually enables the team to formulate workable terms of reference which are also acceptable to the all parties. Both our field experiences and the expert consultation (8.4) brought this home strongly.

Use and applicability: taking for granted partial appreciations of those who declare the problem may lead to lack of cooperation by some social actors who fear their views might be misrepresented or, in case they cooperated anyway, to frustration on their part when the eventual results of the RAAKS exercise are presented. In the case of our bio-energy study which was paid for by OBL, a Dutch agro-industrial foundation, in the beginning a remark often heard among stakeholders was: *this is just a new lobby attempt by OBL ...* Until it became clear that alternatives to bio-ethanol outside the immediate range of interests of OBL, would be covered also. It also took some accommodation on the part of OBL who financed the study. It had been established as an organization to inquire into the possibilities for the use of bio-ethanol from agricultural products. At first, other lines of inquiry were seen as 'competing'. At the end of phase A, however, it became clear how important relevant diversity was, also in view of OBL's own objectives. Without it, no effective pooling of ideas and resources appeared feasible for any of the available alternatives.

Window A2	**Identifying relevant social actors**
The social actors relevant to innovation process have to be identified. Different points of view will probably exist with respect to the relevance of each of them. At this stage *inclusive* rather than exclusive thinking is required.	

Design: the inclusion or exclusion of particular social actors from the inquiry is a matter of careful consideration. In the first place, social actors are included because someone brings them forward as relevant. If subsequently these actors are excluded from the exercise, this might set back the participation of those who brought them forward. In the second place, the decision to exclude certain social actors (such as 'accountants', 'traditional farmers', 'traders') may reinforce traditional views with respect to the social organization of innovation. The most difficult challenge implied in this window is the definition of criteria for 'relevance' of social actors and/or their practices. To form clusters of actors to reduce the number of social actors actively involved in the inquiry might be acceptable. But these can only be tentative. The most advisable at this stage seems to create clusters based on convergences in mission, such as sets of actors focusing on particular priorities for innovation or the 'blood lines' in the Dutch Horse husbandry case (example p. 193). The social actors themselves often express such differences in views when they are asked to compare their own priorities with those of others. The results of window A3 may help to do this.

Validity: this window takes on the boundary issue so central to soft systems thinking. It calls for a tentative definition of what 'relevant actors' are. This implies the team to formulate *parameters for assessing the relevance of the contributions different social actors (are expected to) make to innovation.* As here we are to deal with both the current and the desired situations some of the actors have in mind, as well as with often quite distinct appreciations social actors bring forward, inclusive rather than exclusive thinking is required. Important is that the image generated through this window is never 'finished'. At any point during the inquiry, actors might acquire new relevance in the eyes of the team and/or participants and may be included, or, on the contrary, some might be excluded on the basis of new arguments.

Use and applicability: with the help of this window it is very easy to generate a long list of social actors which one way or the other have a bearing upon particular innovation processes. Important is that each of the actors appears by *name*, of a person or an organization, not just as a category. The reason for this is that this window is to provide us with building blocks to create *actor arrangements* and to argue their role as *social actors*. The list may contain names of persons as well as organizations initially. Eventually, a choice may be made to work at the level of either persons *or* organizations, not both at the same time. However, such a distinction seems more clear-cut than it really is. Networking among organizations is also done by persons. It might be standardized through liaison committees, directories, journals and the like, but persons make it (net)work. The same applies for participation in the RAAKS exercise, only persons can do that. As a consequence, the team faces the difficult task to choose individuals from relevant collectivities engaged in relevant practices and to invite them to participate in the RAAKS exercise.

Window A3 **Tracing diversity in mission statements**
Each social actor somehow related to the process may have his or her own view as to what has to be achieved, between whom and how. This diversity is to be used to trace fundamentally different or even conflicting mission statements amongst relevant actors. A mission statement is taken as a statement that summarizes the objectives, strategy and beneficiaries of the innovative efforts of a particular social actor. It reflects the direction in which this actor probes for innovations in his/her practices.

Design: this window presupposes that in complex innovation theatres, generally, diverse views coexist as to what developments have to be achieved eventually. Consensus is the exceptional case. Therefore, the search is for the *convergences* and *divergences* which occur between relevance social actors. The concept of a 'mission statement' is introduced to refer to an innovative volition in practical terms, stipulating what is to be done, by whom, for the benefit of whom, in the eyes of a particular social actor or group of actors. Coincidence in missions declared by different actors may point at convergence, while fundamental differences may indicate divergences. Probing the strength of the convictions and/or arguments behind different missions helps to gain insight in possibilities for (re)negotiating views between actors.

Validity: in order *to probe volitions*, the intentions of each of the relevant social actors with respect to innovation have to be brought into focus. No inquiry into the social organization of innovation can be conducted without delineating the preoccupations or ambitions that characterize relevant social actors. This can be done by seeking a definition of the actual versus the desired situation in the eyes of (some of) the actors involved. But it can also be done by tracing the motives different social actors put forward to engage in innovation-related activities. To recognize that volitions generally overlap only partially is important.

Use and applicability: tracing and comparing relevant volitions can be fun. It provides participants with an opportunity to probe the their views and those of others with respect to innovation. It may be threatening too. It requires deconstructing beautifully vague objectives (such as '... to increase small-holder family income through the introduction of improved farm technology ...') in order to specify concrete activities, particular technologies, well-defined target groups and stated long term goals for each of the actors involved. The challenge is to formulate distinctive statements in which social actors may recognize their own and each others' intentions with respect to innovation in practice. This can be done, for example, by asking social actors to formulate what they think the mission of other social actors is, and to confront such statements with what the actors formulate as their own mission statement. Such a confrontation of views makes for a forceful input into the workshop foreseen at the end of phase A!

Window A4	**Environmental diagnosis**
Which external factors influence the innovative performance of the actors involved? We may think of natural resource availability, agro-ecological constraints, but also of socio-economic and cultural factors.	

Design: from of the ISNAR case studies, with Stephan Seegers we collected a list of factors which were most frequently mentioned as influential with respect to the social organization of agricultural innovation. This list includes natural and man-made conditions: *agro-ecological and socio-economical diversity, available technologies, external market and/or policy pressures, the availability and need for external resources, and the adequacy of agricultural services, marketing, inputs and communications infrastructure* (Engel & Seegers, 1991). In order to study the impact of the socio-economic and natural environment upon the innovative efforts of social actors, at least these factors are to be considered carefully.

> ***Examples of 'environmental factors':***
> Complex environments require different networking patterns than relatively uniform ones do; the need to target technology development to recommendation domains has long been recognized. Where a variety of technical options is available, networking efforts will be different from situations where research has yet to come up with adequate alternative solutions. Where market pressure is strong, particular networking practices lead to distinct patterns of relationships. Excessive dependence upon external resources for research and development, will contribute to the emergence of particular networking characteristics. Where agricultural services, inputs, marketing and communications infrastructure is lacking, networking will evolve differently; Pijnenburg (1988) demonstrates how colonists in Amazonian Colombia use existing social networks to acquire the necessary knowledge and skills to start farming successfully in an area they do not know at all.

Validity: one of the central activities social actors engage in to innovate their practices, I argued, is *probing context or conditions*. This window brings out the wider context relevant to innovative performance. In order to innovate innovative interaction, relevant limiting and enabling conditions have to be assessed.

Use and applicability: In practice, many of what we call 'external factors' are man-made, created by social actors which for one reason or the other we consider outsiders. Thus it brings us back to the boundary question raised in A2. A frequent example of such a discussion is the *market*. It might well be called an environmental factor. Market prices normally fall outside the control of local actors. But when particular traders or agro-industries play a role in our theatre, it might be in their best interest to participate actively in networking for innovation. As a consequence, this window obliges the team and participants to make *a further qualification of social actors* relevant to innovation: those whose involvement is direct enough to be affected by local networking strategies as against those who are considered too distant (physically or in terms of power) to be influenced. But also it asks the team and participants *to further specify relevant agro-ecological and climatological conditions*.

Window A5	**Clarifying the problem situation**
A specification is made of the innovation theatre by choosing relevant social actors. A first approximation is made of the convergences and resource coalitions which occur. The problem statement as implied in the terms of reference for the appraisal is questioned and, if necessary, redefined.	

Design: This window asks the team to draw up a synthesis of its findings during phase A and to create a tentative image of the social organization of innovation, specifying the domain of interest, the relevant actors, their concerns, their missions and the way they converge or diverge with respect to innovation. Moreover a first attempt is made to trace relevant resource coalitions by discussing the influence upon the innovation process of different leading social actors. Eventually, it requires the team to state their own terms of reference more specifically and to declare what it sees as a workable and widely acceptable definition of the problem situation.

Validity: the window stimulates the team to create a tentative idea of relevant practices, networking and emergent structural forms of social organization. It does so in a more general way, not in detail. The end result is a general picture of how the team perceives innovation to be socially organized, to be presented, discussed and validated in the first workshop with the social actors themselves.

Use and applicability: in order to create an image of the social organization of innovation, RAAKS suggests the use of *actor arrangements*, soft systems' drawings which reflect interpretations of the innovation-related relationships between relevant social actors and with their respective constituencies. This can be done using cards or papers in different forms, drawing different types of lines for relationships and encircling coalitions of actors who appear to converge on the same or a very similar mission (see figure 6). The discussion is stimulated by seeking (not necessarily achieving) to define precise criteria for characterizing social actors, different linkages and the relevance and influence of each of these for directing innovation in the theatre.

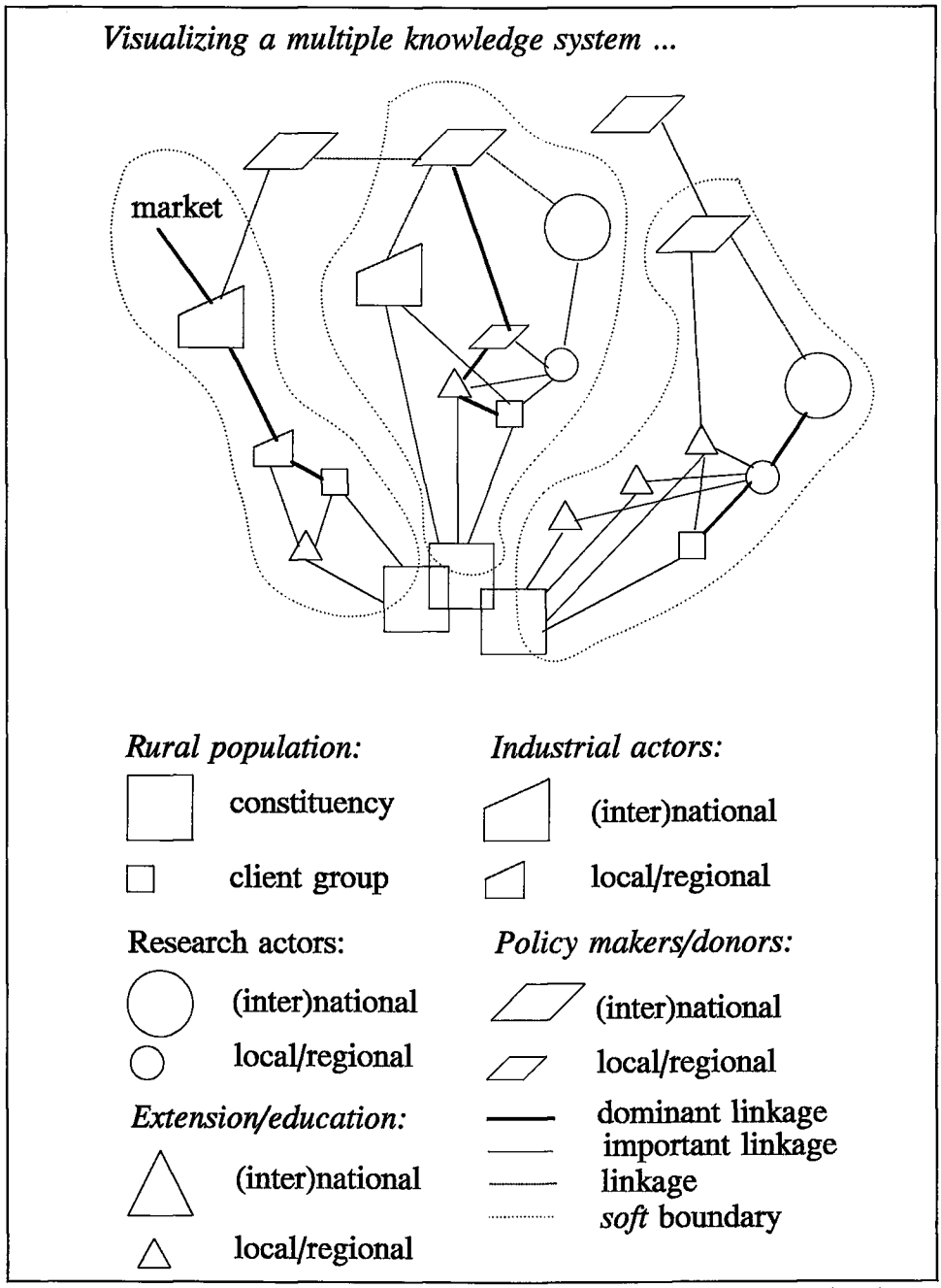

Figure 6: An actor arrangement, using different types of cards and lines, may visualize relationship patterns and dominant issues. The example appreciates three concurrent types of institutional leadership.

Window B1	**Impact analysis**
Is a joint mission recognized by the actors? Or, do various alternative missions play a role? Do actors feel their missions are currently accomplished. Rather than reaching full consensus on a joint mission, the objective of this inquiry is to get an understanding of the different ways actors make sense out of their own individual performance and what they expect or fail to expect from a joint effort. If actors support various, relatively incompatible missions within the theatre, the outcomes desired by one may be the undesirable consequences another hopes to avoid.	

Design: this window recognizes that whoever defines the mission of the innovation theatre in a different way, will also judge its impact differently. In addition, differences of opinion as to the adequacy, effectiveness or efficiency of their innovative practices may exist among stakeholders subscribing to one and the same general mission. It assumes social actors often recognize the need to improve communication and/or cooperation with relevant others, but they fail to specify clearly enough what their expectations are nor do they know exactly what others might expect from it. In other words, they fail to specify what a 'win-win situation' would exactly entail if at all it would be possible. Through this window these criteria can be made more explicit and may be subjected to debate among relevant social actors.

Validity: this the window permits the team to probe somewhat deeper into *the practical consequences of the volitions* brought forward by different actors. A central question is: what criteria do social actors use to judge their joint operations? Identifying the *criteria for defining* impact, effectiveness and efficiency in the eyes of the stakeholders rather than its measurement in 'objective' terms is the purpose of this window. Besides, the actors' views on the type of solution strategy they envisage can be reviewed: do they think problems can be solved or opportunities can be created by improved networking, or do they feel the current patterns of relationships impair innovation to such an extent that an overhaul of current configuration(s) is necessary?

Use and applicability: when a joint mission is agreed upon, such as *to make sure all actors within the theatre have access to all relevant knowledge at all times*, the knowledge, skills and technologies relevant to different sets of actors may be specified and its availability to everybody at all times assessed. However, if missions are less straightforward, probing is to go much deeper. For example, if innovating agricultural practices requires *improving dairy production and marketing for cooperative small-holder producers*, probing should cover the criteria regional processing industries apply to judge agricultural performance of small-scale producers, and vice versa. It might require clarifying biases on both sides: in a particular case in the south of Chile, the small producers were hesitant to cooperate because they thought the industries were out only to rip them off as quickly as possible; the industries, on the contrary, complained that cooperative small producers were too often unreliable and always threatened to take away their production to their competitor. Still, both were aware of the need to improve on-farm productivity, appeared interested in long term mutually beneficial relationships and recognized they might need each other in order to continue being successful in their business.

Window B2 **Actor analysis**
This window proposes that some actors and constituencies are more relevant to achieving successful innovation than others: who are they, and why? What do they do to innovate their practices, what strategies they follow? And what type of innovation, technological or otherwise, they favour?

Design: this window continues the work started with the help of window A2. It assumes an actor-oriented perspective in order to bring into focus the world view and role of each individual social actor with respect to agricultural innovation. Generally, attention is paid to the actors' views on desirable developments, strategies with respect to innovation, mandate, primary activities, available resources and knowledge base. Views concerning the theatre as a whole are important as well: do they perceive their role as part of a whole, or not?

Validity: eventually, an assessment is made of the relevance of the actor to the achievement of important missions adhered to in the theatre and its capacity to exercise leadership effectively. This way relevant practices can be identified and described, convergences and resource coalitions can be traced, and an assessment can be made of his or her strengths and weaknesses with respect to stimulating innovative performance into a particular direction.

Use and applicability: the actor characteristics chosen to assess their contribution to and role in agricultural innovation vary widely from one situation to another, as well as from one team to another. Often, a comparison is made between official policy mandates vis-a-vis actual operations. In other instances, more thought is given to actors' views, strategies and their power to influence events in the theatre. One thing is clear however, the use of actor analysis goes hand in hand with the use of other windows. For example, the results of window B2 are often combined with those of B4 *integration analysis*, which helps to analyze relationship patterns. Combinations with the results of B6, *coordination analysis*, have proved powerful. Interactions between B2 and B3 and B5 have been fruitful as well. An important element in the analysis is whether the individuals or groups referred to in the study are indeed *social actors*, capable of (collectively) influencing decisions by other actors with respect to innovation. Social categories which are not organized as a whole may not be treated as actors in the strict sense. Therefore, in RAAKS the term *constituency* has been introduced to refer to categories of beneficiaries of innovation-oriented programmes which are not capable of taking decisions or acting collectively. The analysis of these constituencies, their views and practices is no less relevant to the analysis of complex innovation theatres but the question of how to organize their participation needs thoughtful consideration in each particular case. In practice, teams have opted for drawing a random sample but mostly they selected key informants in order to guarantee farmer participation in the inquiry.

Window B3	**Knowledge network analysis**
This window assumes the point of view that social actors learn through networking with others. As a result relatively stable networks of relationships emerge with respect to particular concerns or issues of interest. It helps the analysts reflect on the way in which such networks contribute to the generation, exchange and practical use of particular types of knowledge relevant to the innovation processes studied.	

Design: this window assumes a networking perspective. Social actors such as farmers, researchers, extensionists, accountants, veterinary doctors and other actors manage their relationships deliberately. They voice their concerns in the presence of certain other actors they consider knowledgeable or read particular publications because they consider these well-informed and reliable, they listen to radio programmes, read the paper, etc. etc. In the process relatively stable patterns of interactive relationships evolve in which information is produced, exchanged and used. Characteristic of these networks is that every participant is source and user of information at the same time. Some may be knowledgeable on one issue while others contribute to another. Each social actor adds value to the network by transforming his or her ideas, experiences and information into intelligible information in the exchange with others.

Validity: studying these networks contributes to understanding networking practices, knowledge and communication networks relevant to the inquiry of the social organization of innovation. Emphasis on the *generation and exchange* of knowledge and information helps to explore the interplay between actors from different types of practices in knowledge networks. When the *origin and actual use by individual actors* of knowledge and information is taken as a starting-point for inquiry, value-added communication networks can be studied.

Use and applicability: Both approaches mentioned above have been used extensively and proved their usefulness in various occasions. A third approach, focusing on the *concerns or themes* social actors exchange information about, has been tried out experimentally. It facilitates the study of knowledge networks in large, complex theatres with numerous actors who can only be approached by questionnaire. The main difficulty with the application of this window is to avoid traditional conceptions of knowledge, as a static and/or technical entity, and to start thinking in terms of knowing, a permanent social reconstruction of understanding on the basis of reflexive practice.

Knowledge and communication networks can be drawn as actor arrangements or presented in tables, specifying knowledge types, sources, intermediaries and users. In particular cases, especially when commercial transactions are involved, it might be useful to specify knowledge products (information, advice, equipment, patents, software, etc.) being exchanged between actors. Discussions may concern the relevance of different types of sources to certain clusters of social actors, the lack of access to relevant knowledge and information of particular actors or constituencies and the speed of knowledge exchange and information transfer and their relevance to innovative performance of the whole.

Window B4 **Integration analysis**

This window focuses the attention on whether different social actors interact with each other and whether their links concern communicative interactions or also financial or administrative control. Clusters of social actors may be identified around key actors that demonstrate particular characteristics as far as networking and learning for innovation is concerned.

Design: this window focuses on connectivity, interactive links between social actors in general. First the types of links to be included in the analysis are to be defined. Normally these include resource linkages, administrative and communicative links. By determining the existence of such links between social actors resource coalitions and communication networks can be recognized. If necessary a detailed analysis of particular linkage mechanisms may be done. Its purpose is to determine the role the link plays in enhancing coordination of tasks between social actors. Results of integration analysis can be drawn as actor arrangements or presented in a linkage matrix, an n x n table specifying in each cell the relevant parameters of the link. Discussions concern the choice of relevant parameters to characterize a link, the relevance and impact of particular links for the innovative performance of the theatre as a whole and the relevance of the resources pooled within a cluster of social actors to directing the course of agricultural innovation in the theatre.

Validity: through integration analysis a first attempt can be made to bring networking practices, resource coalition, communication networks and institutional configurations into focus. Well-used, it is one of the most complete windows on the social organization of innovation. Its use proved relevant in a large number of studies. It helps identify strongly interrelated clusters of actors yet it does not contemplate convergences.

Use and applicability: this window is one of the most frequently used instruments for inquiry into the social organization of innovation. It permits the elaboration of a relatively comprehensive picture of relevant coalitions and networks within a brief period of time. However, because of its general character it tends to overemphasize the more structural, formal contacts to the expense of informal ones. Also, initially researchers often assumed each link to be equally relevant to innovation. The more integrated the actors operated the better it was often assumed. Van Beek (1991) introduced *perceived importance* as a characteristic of links to be studied and discussed with practitioners. His evidence demonstrates how managers attach different priorities to different links.

Window B5	**Task analysis**
This window focuses on 'who does what?' Practices relevant to innovation are identified, such as farming, research, trade or quality control and the actors performing these tasks are identified. Gaps or overlaps may appear as to the performance of tasks.	

Design: this window assumes a more functional perspective. It focuses on 'functional calibration' between social actors in complex innovation theatres. As a first step, the team and participants are to define which functions are to be performed in order to successfully innovate agricultural practices. Traditionally, such a question was answered by referring to research and extension and may be, farming and education. Field studies demonstrated the relevance of other social actors such as policy makers, veterinary services, input suppliers, agro-industries, banks, certification committees and traders. Therefore, the list of relevant practices is to be the result of intensive probing and debate, just like it was the case with the list of relevant actors. After that, one may ask which actors are involved in each of the practices.

Validity: the window helps shed light on relevant (social) practices, overlaps and missing functions between actors, and (in combination with the results of B4) on the adequacy of emergent structural forms as well.

Use and applicability: the importance of a thorough discussion prior to a declaration of 'relevant practices' is illustrated by what happened during a RAAKS seminar in Costa Rica. While five groups elaborated a relatively foreseeable list of relevant practices as policy-making, fundamental, applied and adaptive research, transformation, dissemination and use, the Nicaraguan group, very conscious of the role of the free market in their economy, added *quality control* as a function. They considered those social actors in control of setting the standards for quality of agricultural inputs and/or marketed produce would be extremely relevant to deciding the course of agricultural innovation. It confirmed the relevance for example Swanson (1986) attached to studying certification procedures, such as those seeds or chemicals, and recent experiences with ecological product certificates as a means of stimulating particular types of agricultural innovation on the farm level. A similar experience we had when farmers indicated the accounting bureau as one of their main sources of information when strategic decisions were at stake. The most important issue seems to be to check the views of the stakeholders with respect to the relevance of a wide variety of practices to agricultural innovation.

Window B6 **Coordination analysis**
This is a window that helps identify leadership and coordination efforts by social actors with respect to innovation. Key questions are: Who pulls the strings? Who takes important decisions? Who has the means to implement them? Who accomplishes leadership? In what sense? How?

Design: this window assumes an organizational perspective. It makes use of the basic configurations designed in chapter five to study leadership and coordination in agricultural innovation theatres. It helps identify leading actors and the means by which these strengthen coordination amongst relevant social actors in the theatre. This leads to (1) a characterization of the way tasks are coordinated between relevant actors (if at all) and (2) a clarification of criteria for assessing a social actor's influence upon the direction innovation takes. After this, the impact of each of the leading actors on the agricultural innovation process can be studied, when findings from this window are combined with those of B1 and others. The main line of inquiry is a debate on the positive and negative consequences of strong leadership by particular actors.

Validity: the window helps bring out dominant resource coalitions and the (multiple) configurations which may be the result of that. It has to be combined with A3, B2 and B3 to make a more comprehensive interpretation of institutional configurations or emergent multi-actor networks possible.

Use and applicability: different types of leadership occur. Not all core actors lead in the same respect. Some accomplish political or financial leadership, or both. They set priorities, provide finance and impose administrative or other regulations. Others acquire technical leadership on the basis of know-how and experience. Still others formally or in a more informal manner represent relevant constituencies or markets effectively in the eyes of other core actors. The basic configurations prove to be an interesting tool to highlight and debate leadership issues and, consequently, to study how different types of leadership are (socially) constructed. A focus on coordinating mechanisms helps to study the intricacies of the implementation of power and influence in complex theatres. It is not enough to declare a dominant influence of, let us say, a donor upon a particular innovation process. It is necessary to pinpoint with relative accuracy the mechanisms through which this donor imposes its grips on developments so that the benefits and/or impairments to innovation which occur as a result of it can be assessed. The most important difficulty encountered with the application of this window is to keep up a balanced, as much as possible non-partisan view within the team - and among core participants - about the pros and cons of particular type of leadership for innovation. As these discussions very directly involve power issues, views can not be expected to be impartial. Therefore, an open atmosphere has to be created in order to enable participants to discuss their interpretations without feeling threatened.

Window B7	**Communication analysis**
This window helps to study the effectiveness of communication between actors; do they speak the same 'language'? Do they mean the same thing if they use a particular word? If they meet, is fruitful dialogue possible?	

Design: this window takes as a point of departure that the social construction of knowledge for innovation is contingent upon effective communication among social actors from relevant practices. This window has been chosen to focus on particular barriers which obstruct effective communication between social groups, not to discuss networking practices as such. The problems rising between indigenous communities and official language speaking extension workers are well known. But even when extension workers or researchers speak the same mother tongue, the cultural differences created by the differences in their upbringing and education may cause formidable communication barriers. Peasants in the South of Colombia at times were puzzled by the use of the Spanish word 'selection' by extensionists to refer to the selection of potato seeds for sowing. For them the 'selection' was the village soccer team. After some explanation, of course, it became clear that the same process of 'selecting the ones that will do best' was referred to, only that the criteria for selection had to be adapted. A detailed study by a team of communication specialists, including a national anthropologist, found over 175 words of low or doubtful comprehensibility in common extension language in the South of Colombia, even though farmers were native Spanish speakers and all extension workers were sons or daughters of local farmers (Estrada et al., 1983).

Validity: this window focuses the attention of the research team and participants on impairments to communication implied in culture and the use of language. If such impairments exist, intervention design for improving innovative performance has to take these into account. The window is of extreme importance for RAAKS itself, as these impairments are to be expected to influence its outcome directly.

Use and applicability: to operationalize this window has not been easy and is not finished yet. Suggested analytical questions focus on social, cultural and cognitive differences between actors as well as constraints to communication. Results can sometimes be related to earlier information about world views expressed by social actors. Wagemans (1987) points at a useful analytical distinction between the formal domain, and its formal rationality and use of language, and the field domain, where rationalities differ and language is used in a common or local way. Within the scope of a RAAKS exercise however, such differences can hardly be studied in detail. What can be done is to point out potential impairments on the basis of some concrete examples the RAAKS team and participants became aware of during the exercise. Often, such examples are to some degree consistent with findings in other windows. The degree to which such impairments in fact block effective communication for innovation is often hard to determine within the scope of a RAAKS exercise. However, because of its potential negative impact upon the RAAKS exercise as well as because of its relevance for designing interventions in support of innovative performance, the team should study such examples with extreme care and recommend further investigations when this may shed a more detailed light upon its relevance to innovative performance.

Window B8 **Understanding the social organization of innovation**
This window focuses on recollecting the insights the team has gained till now in order to summarize these in the form of a report and presentation to be used in the next workshop with other participants. Central questions to be answered are: what are the main convergences, resource coalitions and communication networks within the theatre? What are the main impairments to innovation and what opportunities exist for improving the way social actors interact for innovation.

Design: the window suggests to continue the discussions initiated in A5 and to integrate the team's results into a more detailed and clearer picture of the way social actors interact for innovation. A synthesis might be constructed using different (system) drawings, for example using cards and lines to represent actors and relationships as done in figure 6. The purpose is to develop an image of the situation which reflects both multiplicity and actor alliances adequately and which can be presented in the form of drawings, statements and/or reports during the second workshop in order to be discussed and validated by the participants.

Validity: the validity of the window depends on the team ability to discuss all aspects of the social organization of innovation in detail. Are the missions of the most important social actors clear? Do they agree on some shared mission(s)? Do these convergences coincide with the resource coalitions and communication networks that were found? Is the leadership of (some of the) core actors well established and does it contribute to achieving the mission(s) agreed upon? What obstructs an adequate innovative performance of the different alliances? What opportunities can be identified for improving their performance? Can different institutional configurations or emergent multi-actor networks be identified which play a role in enhancing and/or impairing innovative performance? Why? Who can do something about it?

Use and applicability: in accordance with the appreciations of the different teams, the results of this window are as varied as the situations they refer to. The most difficult aspect might be to achieve a synthesis from the richness of materials collected over a brief period of time. The discussion of alternative propositions, arguments, and ways of presentation within the team has to be open-ended and inclusive at the start yet selective and decision-oriented towards the end. This requires a skilled management of group dynamics and communication. The representation of the eventual results in the form of drawings and a synthesis report requires a careful choice of figures and texts and some professional editing. The presentation to the workshop participants is to be complete but concise in order to keep as much of time as possible available for discussions.

Window C1	**Knowledge management analysis**
Central question is 'what can be done in order to enhance innovative performance?' It is recognized performance and impact may be looked at from different angles, and that social actors do so. For each 'mission' identified earlier, it helps the team and actors to design and debate concerted actions to change the present dynamics of the situation.	

Design and validity: the innovative mission social actors adhere to sets the stage for their activities in the theatre. If an agreement exists among all, one such a mission may be taken as the point of departure for judge innovative performance. Otherwise different missions created by different subsets of actors have to be recognized and treated in a parallel manner. As a first step, this window suggests to characterize the problem situation: can the problems possibly be overcome by improving current networking practices among stakeholders? In such a situation, the effectiveness and/or efficiency of current networking patterns might not be sufficient, but no structural impairments have been identified in the social organization of innovation. If so, the team chooses to design a *network improvement strategy*. If, on the contrary, structural impediments have been brought to the open, such as lack of relevant diversity, a structural lack of influence of particularly relevant social actors or a lack of accommodation on the part of current actors to new demands, new challenges, new circumstances, not only networking practices but also the emergent structural forms of social organization of innovation can be thought of as inadequate. In this case the team may aim at a more demanding *network re-configuration strategy*. Such a strategy, in addition to improving networking efficiency and effectiveness implies the redesigning of present structural forms, including institutional configurations, convergences, coalitions, communication networks. A strategy to privatize extension and research is such a structural intervention. It is originates from the realization on the part of leading social actors that existing configurations are unable to cope with new demand in terms of market orientation, competitiveness, etc.

Use and applicability: not many recipes can be given to would-be knowledge managers at this stage. In assessing what can be done to overcome current problems, the process seems to matter more than the eventual outcome. Wide participation and consensus among relevant social actors seems overridingly important in view of eventual implementation of the recommendations formulated. Such recommendations generally are concerned with improved cooperation and/or communication strategies or other concrete solutions to overcome lack of dynamic interaction between actors considered relevant to a particular type of innovation. With respect to innovating and upgrading natural resource management, Röling (1994) calls for the formation of 'soft platforms' to be able to prepare and/or take decisions collectively with respect to complex issues. Creating forms of agency at higher levels of social aggregation may often be what creating a 'win-win' situation in RAAKS is about. However, in many concrete situations solutions might be more specific, less complicated and more short term, such as creating a common database, doing a research project together, establishing a newsletter, or organizing a workshop or conference. We will see a number of examples of it in chapter nine.

Window C2	**Actor potential analysis**
This window recognizes that no one person or social actor directs complex social innovation processes. Rather, the question is: Who has the mandate and means to help effectuate the changes deemed necessary? And who is most interested to do so? Which key actors are willing to negotiate their participation in the solution strategies proposed?	

Design: If during the application of window C1 concrete suggestions have been made to improve innovative performance, C2 helps the team to review the support such innovations would have among the stakeholders and to assess their relevance to completing the change successfully. On the basis of their analysis the team can propose (measures to stimulate) particular (re)alliances between relevant actors, joint projects or activities. In order to be able to do this, each actor's capacity to influence the way innovation is socially organized at the moment has to be looked at as well.

Validity: actor potential analysis should pave the way for negotiations among actors which may lead to the building of (new) alliances to probe and decide about new volitions, alternative (technical) options, and reinterpret contextual issues in order to enhance innovation. The validity of this window is not in its focus upon one aspect of the social organization of innovation in particular, but in its contribution to the process of suggesting possible alliances of stakeholders, pooling of resources, etc. in order to improve innovative performance.

Use and applicability: Active participation of stakeholders is a fundamental condition. The window is only applicable if, within the scope set by an agreed upon mission, a number of social actors is willing to meet and assess their possibilities to improve the situation collectively. If such willingness does not exist, not even after the RAAKS exercise has been almost completed, the team may make suggestions but leave it to the actors to draw individual conclusions and, if they wish, act upon these.

Window C3	**Strategic commitments**
Finally, recommendations may be drafted concerning concerted actions, cooperative and/or communication strategies the implementation of which may successfully be negotiated among (selected) key actors. Strategic commitments may be obtained from these actors to participate in such negotiations.	

Design: After (almost) completing the RAAKS cycle, negotiations among stakeholders will be necessary to reach at least partial agreements on particular interventions and/or actions. RAAKS does not (yet) offer concrete guidelines for doing this. What is expected in this stage is the elaboration of concrete *project proposals*, and an assessment of the resources needed to carry them out. Generally, it is not within the competence of the RAAKS team members and participants to take decisions on such proposals. However, they can be prepared and channelled into the proper procedures afterwards. The *commitment* of relevant stakeholders (not *all* relevant stakeholders necessarily!) to follow up on the project proposals individually, and to participate in a concerted effort to take the projects from detailed design through to implementation is the desired outcome of RAAKS.

Validity: Again, the validity of this window is in its contribution to achieving a verbal commitment on the part of relevant social actors to execute or participate in recommended actions.

Use and applicability: in the original design of RAAKS, *diagnosis* rather then *project planning and implementation* is emphasized. The need for tangible results was recognized but the accomplishment of concrete activities to follow-up on recommendations was left to the stakeholders completely. The applicability of this window could further be enhanced by designing specific proposals in order to facilitate the implementation of follow-up actions. However, until now it served mainly as a reminder to team and actors of what it meant to agree on certain recommendations. On the one hand, this is a strong point: RAAKS makes the social organization of innovation visible and more comprehensible, yet does not oblige social actors to implement the recommendations. Social actors may participate more freely in the learning process as a result. There is more room for building new insights and relationships, for surprise and for unbound creativity. On the other hand, it limits the impact of the approach. Leading social actors can simply ignore the recommendations if they wish. Until now, RAAKS has tried to hold the middle: emphasize dialogue and creativity as well as the need to achieve a verbal commitment to action, but refraining from imposing strict evaluation criteria for follow up. In chapter nine we will come back to this point.

8.7 Preliminary conclusions and some critical issues

In this chapter I have answered two of my research questions: Q3, about the criteria an action-oriented methodology would have to meet, and, tentatively, Q4, about the possibility of designing such a methodology. In 8.2 I asked myself whether intervention in complex innovation theatres can be useful and when. I concluded two conditions had to be met: (1) a number of relevant social actors feels uneasy with the way innovation is socially organized and (2) they wish to collaborate in assessing current impairments and/or opportunities and design measures to improve it. In 8.3 I then listed a number of criteria structured inquiry into the social organization of innovation would have to abide by in order to be able to contribute to achieving such aims (Q3). Then I described the design process and the choices which have resulted in my preliminary answer to question Q4. My answer is yes, and my proposal is: RAAKS.

In principle, RAAKS follows the specifications I laid down in 8.2 and 8.3. It is designed as a soft systems methodology to enable stakeholders to engage in meaningful discourse about the social organization of innovation with respect to common concerns. It leans heavily on appreciative systems thinking. The images it helps create emphasize social interaction between social actors from different relevant practices and help stimulate debate and reflection. Active participation of stakeholders is foreseen and also a thorough reappraisal of the problem definition. Besides, RAAKS with its threefold objective - to raise awareness and understanding, to probe new alliances and to formulate action proposals - is facilitative and action-oriented and has the potential to generate to tangible results. Moreover, RAAKS contributes to an accumulative, social learning process among stakeholders leading from problem appraisal (A) to action definition (C) and also stimulates a joint inquiry into relevant practices, networking and emergent structural forms of social organization for innovation (A, B). It does so by offering a variety of windows, or views from different analytical perspectives. The integration of these windows is obtained by the use of a conceptual framework rooted in appreciative knowledge systems thinking.

The role of the windows merits some more detailed attention. The windows help focus on particular issues quickly. Table 12 summarizes which of the issues relevant to the social organization of innovation is addressed by each of the windows in particular: problem definition, relevant practices, networking practices, convergences, coalition building, communication networks, innovation configurations or action definition. The table illustrates that RAAKS' windows offer complementarity as well as overlap. Each of the relevant issues can be studied from different angles but enough overlap seems to exist to integrate different findings. Besides, the richness of perspectives in RAAKS provide teams with an opportunity to make a choice of windows, particularly with respect to phase B, which suits particular circumstances and objectives. Through its use of windows, not only RAAKS' analytical design but also its procedural design is more flexible so that a team may adapt it to situation-specific conditions.

As a consequence of its flexible design, RAAKS may be used in different ways. Its original design corresponds to a participatory action-research methodology. The ones to implement such an exercise would be a team of specialists, some subject-matter specialists some acquainted with RAAKS. Stakeholders participate actively as co-researchers.

However, RAAKS' analytical design can also be used within the context of more traditional, qualitative field research. The windows and tools provide the researcher with a coherent set of perspectives to study the social organization of innovation. Besides, by reducing the depth of study in most windows, RAAKS can be used to guide an 'excursion-type' inquiry or a training session concerned with the way innovation is socially organized. Finally, policy makers and managers at different levels may use RAAKS as an instrument to gain more insight into impairing or enabling conditions or perhaps even to gauge innovative performance regularly.

Table 12: The use of RAAKS' windows upon the social organization of innovation

Focuses on: / *Window:*	Problem definition	Relevant practices	Netw. pract.	Con-vergen ces	Res. coali-tions	Comm netw.	Innova tion config.	Action def.
A1: redefining appraisal objective	A							
A2: identifying social actors		A						
A3: tracing mission statements				A				
A4: environmental diagnosis	A							
A5: synthesis/problem situation	S/D	S/D		S				
B1: impact analysis	A							A
B2: actor analysis		A		A				
B3: knowledge network analysis			A	A		A	A	
B4: integration analysis			A		A	A		
B5: task analysis		A						
B6: coordination analysis			A		A		A	
B7: communication analysis				A		A		
B8: synthesis/social organization	S	S	S	S	S	S	S	A
C1: knowledge management	S/D		D	D		D	D	D
C2: actor potential analysis					D		D	D
C3: strategic commitments		D						D

Activity: A = analysis/appraisal; S = synthesis; D = design/choice.

However, notwithstanding our optimism with respect to the design we may already point at some critical issues as well:
Firstly, there are a number of practical questions which have to do with the social context in which RAAKS has to be implemented. Active participation of relevant stakeholders implies that these latter *must be willing* to do so. That is, the situation must be sensed as problematical by an important number of them and they must expect some benefit from looking at it together. In other words, they must perceive some form of mutual interdependence. Particularly where current configurations or networks are less articulated, this makes the RAAKS exercise into a rather diffuse, social process itself which can be hard to 'manage'. It may also result in RAAKS being more suitable in theatres where a degree of articulation for innovation among social actors has already been achieved. Next, will social actors be *critical* enough when looking at their situation?

Will they be willing to share information on issues which formerly were protected from 'outsiders' not belonging to their organization or group? A next question is, what is the *time frame* one has to have in mind when doing RAAKS? In our inquiries, six weeks to six months was indicative. But very interesting 'excursion-type' exercises have been done in less than three weeks and one may find that in certain situations a year might be more adequate. Perhaps the most intriguing concern about RAAKS is its explicit recognition that there is *no predefined outcome* though there are clear objectives. RAAKS is a learning process itself, starting from a vaguely defined initial problem statement about a situation which may look completely different according to one's point of view. So, per definition, the outcome in terms of learning, insights, new allies or new alliances can not be determined in advance. This is fundamental to the type of inquiry complex innovation processes require, but does it also provide a strong enough motivation for the joint action RAAKS requires? Finally, we may anticipate RAAKS to be strong in generating new insights, understanding and, perhaps, proposals for new designs of relationships, but how strong will it be in generating concrete actions when it seeks *verbal commitments* only?

Secondly, there are some methodological concerns, for example, RAAKS' plainly *discursive* character as Rap (1992) has pointed out. Not all social actors relevant to agricultural innovation processes are equally skilled or willing to participate in debate and reflection. It remains to be seen how this limits RAAKS' applicability in practical and cross-cultural situations. Also, every RAAKS team will create its own *unique, context-specific exercise*. This is favourable from the point of view of flexibility. But how will it affect the quality of the research outcomes and the possibilities to compare different experiences later on? And then, would RAAKS be able to help research teams avoid the trap much knowledge systems research has fallen into and help create a balanced inquiry emphasizing *both formal and informal* social interaction?

A final methodological concern is the actual choice of windows. If (systemic) images are supported these are mostly *actor arrangements*. Other types of windows might have to be included more systematically. For example, the construction of human *activity arrangements* are not yet supported by RAAKS although these could be useful to study relevant practices, including networking practices. RAAKS supports looking at relevant practices when identifying and characterizing relevant social actors (A2, B2) and, in more detail, when task analysis (B5) is done (see table 12). But this inquiry is not very detailed. It was felt impossible within the time frame we had in mind for the exercise. For the present this is defendable and even desirable. RAAKS can not cover too much at the same time. However, exploratory field studies into research practices in farming systems research (Rap, 1992; Beyene, 1994) seem to underscore the importance of studying relevant practices in more detail. Moreover, Stolzenbach (1992) shows how under very harsh conditions peasant farmers in Mali create an experimental practice ("shifleli") which would be worth studying as part of our inquiry into the social organization of innovation. These studies confirm the importance attached by Gremmen (1994) and sociologists such as Leeuwis (1993) to a detailed study of relevant practices as part of a research tradition into the social organization of innovation.

We could go one step further and suggest that the use of *input/output arrangements* within the context of RAAKS might be explored as well. This has been attempted although not

very systematically. Initial results were not very promising. The 'source-intermediary-user' sheet for knowledge network analysis is a remnant of these try outs which has proved useful. Task analysis was originally based on a input-throughput-output reasoning also. However, it had to be modified for use in RAAKS as it stimulated linear thinking rather than interplay thinking to study the social organization of innovation. Our experiences with such models to stimulate reflection and debate are nevertheless incomplete. It warrants further research to see whether from adapted input/output arrangements, for example using problem-solving or decision-making models, we may expect relevant contributions to studying the social organization of innovation from a soft systems perspective. The 'main menu' I discussed in chapter 3 suggests we might.

Finally, still other types of analytical perspectives might prove interesting eventually such as *historical* or *cultural* ones. Obate (1992) studied three generations of farmers and the way they had learned and continued to learn bout agriculture since they were born. It provided useful insights into the influence of subsequent interventions upon the quality of learning within agricultural practice. Millar (1992) on the other hand, studied in detail the influence of the farmers' cosmovision upon agricultural practice. It provided a vista on the influence of cultural values and relationships upon the dynamics of innovation in agriculture. Finally, *negotiation* between social actors from different practices has been laid bare in recent sociological studies (Arce, 1993). Windows which address such issues might eventually have to be integrated in RAAKS when its emphasis shifts from its present, mostly diagnostic approach to a more project-oriented one.

At the end of chapter nine, after discussing some of our initial experiences with RAAKS I will attempt to formulate at least some tentative answers to these and other questions which may still arise. For now, I am satisfied that a action-oriented methodology can indeed be designed to contribute to designing improvements to the social organization of innovation in agriculture. Relevant criteria for such a methodology have been formulated. Only experience can tell whether the design I suggest will live up to expectations. In the following chapter, I will concentrate on probing the potential and limitations of RAAKS in practice in order to complete my study answering my last research question (Q5).

9. *Putting RAAKS to the test: initial field experiences*

"Oh, yes, professor, I have learned a lot; I am still confused, but at a much higher level!" (Maurice Rolls, pers.comm.[1])

9.1 Introduction

In this chapter I will do a first and far from conclusive evaluation of RAAKS as a methodology. As I have proposed in chapter one (1.9), I will argue its efficacy, its use and applicability under varying circumstances and its usefulness to development professionals and researchers. First, with the help of 15 case studies, one in the Netherlands 14 in Central America, I will demonstrate how RAAKS can be used to investigate the social organization of innovation and to design useful interventions to improve it (9.2, 9.3). Secondly, I will return to RAAKS' design and operational objectives as well as the criteria formulated in chapter eight, to evaluate in how far RAAKS fulfilled our expectations as a methodology. Thirdly, I will review our experiences with RAAKS and discuss the social contexts in which RAAKS seems to be applicable. In addition, I will argue RAAKS' relevance to development practice by situating the methodology within an emerging tradition of 'alternative systems of inquiry' (9.4). I conclude the chapter with a number of critical reflections and propositions (9.5).

The field experiences obtained with RAAKS over the past years are varied and many. Firstly, graduate students contributed to the further elaboration of analytical perspectives and hence, to the specification, validation and adjustment of 'windows'. Later, when the methodology had been formulated more consistently, other students took it into the field to test parts of its analytical and procedural design, and critically appraise its intentionality. Students efforts led to over 30 case studies from which valuable lessons could be drawn. Sometimes even more than their actual research results, the students' struggles in trying to operationalize and apply the knowledge and information systems perspective, proved of great value. Also, after graduation many of them remained active in networking and sharing experiences on RAAKS and similar experiences. A second current of experiences which contributed to the design and testing of RAAKS was its use in the (inter)national education at Wageningen Agricultural University and at the International Agricultural Centre. Our experience with learning-by-doing-RAAKS during short courses, among other things, helped identify optimum levels of 'creative confusion' needed to intellectually engage participants in the exercises to the maximum. Thirdly, with the help of interested institutions we implemented a number of comprehensive

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[1] Originally part of a story Maurice Rolls, as Chairman, told the participants of the International Seminar on Rural Extension Policies, June 1989, at the IAC, Wageningen; since then a frequently used reminder to the complexities involved in knowledge systems education.

RAAKS exercises. In these we were able to use the methodology entirely according to its design.

In this chapter I will mostly refer to this last set of experiences. They reflect what we had in mind with RAAKS most precisely. This provides me with 15 case studies to draw from: one application of RAAKS in the Horse Husbandry Sector in the Netherlands and 14 in basic grains producing areas in six Central American countries. In addition, I will briefly review a number of experiences of graduate students using RAAKS in a more research-oriented mode, particularly to review RAAKS' use and applicability in situations which differ from those addressed in the case studies. Box five summarizes the case studies I refer to in this chapter.

#	Authors	Sector/theme	Country	
1	Engel, de Groot, Meijering, Elema	Horse husbandry	Netherlands	1990
2	Woltersbeek	Green areas development	Netherlands	1990
3	Corten	Forestry	Netherlands	1991
4	Ravensbergen	Horticulture	Neth./Israel	1991
5,6	Castillo, Guardado	Basic grains, 2 areas	El Salvador	1992
7-9	García, Cifuentes, Davila, Wotzbeli, Rivera (2x) Collado, Adlai	Basic grains, 3 areas	Guatamala	1992
10-12	Jaén, Palacios	Basic grains, 3 areas	Panamá	1992
13	Espinoza, Cruz, Miranda, Lucas	Basic grains, 1 area	Nicaragua	1992
14-16	Zamora et al.	Basic grains, 3 areas	Costa Rica	1992
17,18	Juarez, Lavaire	Basic grains, 2 areas	Honduras	
19	Noordermeer, van Zanten	Pisciculture	Netherlands	1992
20	Adolfse	Food	Denmark	1992
21	Meijer	Small-scale producers	Chile	1992
22	Bemelmans	Export apple production	Chile	1992
23	Boonekamp & Kleis	Senior services project	Netherlands	1992
24	Bakker, Adolfse & Engel	Trafic and transport	Netherlands	1993

Box 5: RAAKS experimental studies referred to in this chapter

9.2 Studying the role of the National Reference Centre for Horse Husbandry

During the late 1980ies agricultural research and extension in the Netherlands was restructured. Government extension was privatized and was to draw a progressively increasing proportion of its income from paid services. Government research institutes were made more autonomous and brought under a newly established private foundation. Until that moment, in the Netherlands, the agricultural knowledge and information system had been characterized by its almost 'corporatist' nature. Centralized decision-making, consensus and openness were considered important qualities of the way innovation was

socially organized. Consensus was brought about by coordinating bodies, such as the Agricultural Council ('Landbouwschap')in which the Government, the farmers' organizations, the agro-industries and the agro-industry's labour unions took part. Internal openness concerning the exchange of knowledge and information was widely believed to be one of the main reasons behind the international success of Dutch agriculture. As a consequence, the Ministry of Agriculture, Nature and Fisheries wanted to maintain the free flow of vital knowledge and information after privatization. It established a number of National Reference Centres ('Informatie en Kennis Centra' or IKC in Dutch), among which one for crops, one for animal production and one dedicated to nature, forest, landscape and wild life development. These were to act as knowledge brokers between relevant social actors within a sector. As the Government remained the single largest spender on agricultural research, government-funded research programmes were seen as an important source of knowledge and information they could draw on. Moreover, as a government service they maintained direct access to information on policy development at the national and international level. The centres were staffed with technical, economical and communication specialists from the ex-government extension services. Not surprisingly, the recently privatized extension service ("Dienst Landbouw Voorlichting" or DLV) remained their most important customer initially.

Appraisal objective and background

At the Reference Centre (IKC) for animal production, a sector specialist for horse husbandry was appointed in 1990. To enable this specialist to familiarize herself with the sector and to diagnose the situation she was to contribute to, the IKC was interested in doing a RAAKS exercise. It asked for an analysis of the knowledge and information system for horse husbandry in the Netherlands to support two workshops with relevant social actors. The following objectives were formulated: (1) to provide insight into the knowledge and information system in the sector, (2) to highlight constraints in its functioning, and (3) to further define the position of the newly formed national reference centre in it. The exercise was not meant to be conclusive, it meant to initiate discussions with respect to improving knowledge 'circulation' in the sector. A team of four researchers was formed, two from the IKC and two from the Communication and Innovation Studies Department of Wageningen Agricultural University. A study of secondary sources and interviews with key actors led to a first tentative description of the way innovation was socially organized and was discussed during the first workshop. Constraints and opportunities to knowledge and information exchange and the IKC's possible contributions to it were discussed during the second workshop in which almost all participated again. This section makes use of the validated results of this study (Engel et al., 1990).

The study was set against the background of the most important strategic developments which affected knowledge and information generation, exchange and utilization in the sector. With the help of the actors these were identified as (1) the introduction of co-financing as a principle in research and extension, (2) the professionalization of horse breeding in the more market oriented branches due to increasing demands on stud owners to invest in new technology which leads to a decrease in the number of stud owners active professionally and (3) a gradually decreasing interest on the part of the public in betting during horse races which causes a decrease in benefits flowing back into the sector.

Defining and surveying the domain of inquiry

'Horse husbandry' was defined broadly, to include breeding, multiplying, training, caring for and trading horses and ponies as well as their competitive and recreational use. Both professional and non-professional forms of the above were included. From the start it became clear such an inclusive definition would cause debate. Its advantage was that all 'activities with horses' were included so it would enable us to draw a general picture of the options for intervention by the IKC. However, not all social actors would easily agree to such a definition. This became apparent during the first workshop when two delegates from the Ministry of Agriculture, Nature and Fisheries, one representing the recreational and another the horse breeding and export side, engaged in a discussion to whom they thought their minister was accountable: to close to half a million people in the Netherlands who ride horses regularly or to about one hundred professional breeders of quality horses. It became apparent that the farmers' organizations, closely integrated with the breeding organizations, were not generally seen as adequate representatives of the recreational horse riding sector. This underscored the diversity of the sector which expresses itself in a variety of organizations, segments and target groups. Horse racing, breeding and recreational sports are commonly seen as three different segments of 'blood lines' in the sector[2]. The groups for targeting advisory and information services include breeders, stud owners, trainers, training establishments, horse riding establishments, horseback riders and traders. Moreover, in each of these categories one may find professionals who work with horses as a trade and others who do it as a hobby. Amongst breeders and riders hobbyists are by far the majority, but even among stud owners this seems the case. As can be expected, the question who, the professionals or the hobbyists, are most relevant to innovation in the sector, generated heated discussions during the workshops.

The objectives and interests of the different segments of the sector differ greatly. The horse racing community is interested in breeding fast, competitive horses. A strong character is an asset. Relatively large amounts of money change hands in this sub sector and most participants engage in it professionally. Their intentions are mostly commercial. On the contrary, the hippic sports need other types of horses, easily trainable to serve as recreational riding or jumping horses, for example. A strong, individual character here may be a disadvantage. Generally less money circulates in this sub sector and only a small minority, the owners of riding establishments, are professionals. Finally, amongst breeders hobbyism plays an important role as well. Only few dedicate themselves to breeding as a profession. The respective breeding policies of the 19 existing breeding associations guide their efforts. For some, the conservation of the purity of the breed is the most important criterion, for example for Iceland Ponies, for others the horse's performance in addition to beauty and character. The latter is the case for the largest association the "Koninklijke Warmbloed Paardenstamboek Nederland" (KWPN) which registers the lineages of five types of horses and counts more than 23,000 members. In fact, it was concluded that for the horse husbandry knowledge and information system in the Netherlands, not one single mission statement could be formulated which would do justice to all stakeholders. Therefore, the three 'blood lines' were recognized as subsystems in accordance with the way the actors themselves express their differences.

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[2] see: *An example of the results of phase B, horse husbandry in the Netherlands* (par. 8.5)

During the study, both the social organization of innovation within and between these clusters of actors was reviewed.

Research is done by the Veterinary Faculty of the University of Utrecht, the animal production department at Wageningen Agricultural University and at two experimental stations near Lelystad and Brunssum. Research capacity is relatively limited and, in 1990 it was still unsure how the sector would react to the co-financing principle imposed by the government. Research concentrates mainly on veterinary science, internal diseases and propagation (University of Utrecht) and on health, nutrition and training (experimental stations and Wageningen University). The DLV is the most important extension service with respect to horse husbandry. Commercialization drives DLV to select only those target groups who can pay either directly or indirectly. At the moment it directs its services to training or riding establishment holders, stud owners and breeders. The DLV team horse husbandry consists of one team leader and four advisers.

Improving the social organization of innovation

The study generated a large number of insights into the social organization of innovation in the horse husbandry sector. These were interesting enough to guarantee active participation of all invited participants during the two workshops, one lasting one day another half a day. Eventually, a number of constraints were identified which were agreed to affect the knowledge and information household within the sector considerably. For each of these a specific recommendation was jointly formulated. The participants agreed to take these recommendations to their respective organizations and put them up for discussion there. In the following, I will review some of the constraints and recommendations to illustrate the outcomes of the study.

As a consequence of the diversity within the sector, adequate information retrieval and distribution is difficult. This has led to a situation in which lack of up-to-date information hampers tailoring policy formulation and research and extension programmes to specific needs, particularly with regard to the recreational and non-professional actors. As it concerns the economically weak actors from different 'blood lines', the IKC is asked to survey information needs more precisely and to work out proposals as to how to collect it. Moreover, the actors feel that the policies of the government ministries with respect to their sector are too fragmented and inconsistent. Although they recognize a differentiation has to be made with respect to the 'blood lines', they consider one central body within the ministry would have to coordinate policy formulation. The inadequate operation of current coordinating committees adds to this. It leads the actors to seek bilateral agreements with their counterparts within the ministry rather than to strive at a coordination of efforts. The participants suggested that an existing coordination committee, the 'Commissie van Overleg' (CvO), could be assigned with more specific functions and extended to include new actors so that it could adequately represent the variety of actors in the sector. The functions were listed and the IKC was encouraged to play an active role in re-activating the committee.

Furthermore, it was recognized that the three 'blood lines' maintain relatively little contact with each other. This was not generally felt to be a problem but rather a direct consequence of their diverse interests. However, while social actors engaged in horse racing maintain close contacts with research and extension, hippic sports actors hardly

entertain any relationships with these institutions. The contacts of breeders with research and extension are varied. All maintain close contacts with specialized educational establishments. The virtual marginalization of the hippic sports organization from influencing research and extension policies mirrors their relatively marginal place. This was even more surprising when one considers the fact that they represent by far the largest group of people using the products and services of the horse husbandry sector in the Netherlands (an estimated half a million people). The actors agreed it was up to them to seek more intensive contacts and it was suggested that the hippic sports would have to gain a more prominent place in the revitalized CvO. Besides, further studies were recommended to identify themes for knowledge and information exchange and specific ways to improve relationships between the 'blood lines'. A possible theme for such exchanges was 'farm' management. It was suggested the IKC explore this theme as one of its priorities for supporting a more efficient exchange of knowledge and information.

Important groups within the sector, such as recreational horseback riders and amazons, are organized poorly. This also reduces their influence and access to information. It also makes it difficult for others to reach them. The participants agreed that important reasons exist to try to engage this group of actors more actively in the generation and exchange of knowledge and information. While the interest in horse racing is on the decline, the horse sector will probably have to restructure its offering more in line with the wishes of this group. It does not only represent the largest group of actors but it is the largest group of paying customers as well. Besides, their active participation might increase public support for research and extension in horse husbandry. The CvO was considered the indicated forum to take initiatives in this respect.

> ***An example: Who needs what knowledge to become a successful horse sector practitioner?***
> The workshop participants agreed the following types of knowledge could be and had to be distinguished when debating knowledge and information needs of social actors in the horse husbandry sector. Each of these implies a distinct set of ideas, concepts, routines and skills: (1) horse keeping - basic, (2) horse keeping - advanced, (3) horse riding, (4) horse breeding, (5) horse training, (6) entrepreneurship/management (7) marketing,(8) knowledge transfer and communication, (9) public relations, (10) rules and regulations (set by the organizations/associations), (11) laws and regulations (set by the government). Not all actors need to know everything: *breeders* need mostly 1,2,4, 10 and 11; trainers need 1,2,3 and 5; actors who run a *training or riding establishment* need to be most knowledgeable, they do not need to know about breeding but they need to be acquainted with the rest. *Riders*, besides riding knowledge and skills, need to be acquainted with basic horse keeping only. *Stud owners* may be content with a good knowledge of 1,2,4,6,10 and 11. *Traders* need 1,2,3,5,6,7 and 11 (Source: Engel et al., 1990).

Two types of knowledge were considered insufficiently available within the sector: knowledge on 'farm' management and on marketing. While the first type is currently offered by the DLV, the breeding associations and professional education, the bottleneck remains at the level of the end user. One could possibly think of specific management courses for managers of training and riding establishments. In the design and development

of such courses, as well as of tailor-made administration systems, the IKC could collaborate with other actors. The development and exchange of marketing knowledge and information, on the contrary, was considered too 'blood-line-specific' to be dealt with in a sector-wide manner. It was recommended social actors take this observation to their respective organizations.

Finally, it was observed that research on horse husbandry has no direct relationship with the target groups of the horse husbandry sector. As a result its justification and resource base is unclear. In times of government withdrawal from research funding, this could affect its continuity. For the same reason, it is unknown whether research answers adequately to the needs of practitioners as feedback mechanisms are slack. The suggestion was raised to at least include a representative of the research institutes in the CvO.

Some observations and conclusions

Two of the most lasting lessons of the horse sector case study had to do more with our own conception of what we were doing, than with the study itself. In the first place, when we started the study, we did so because we thought the horse husbandry sector would be a relatively simple, straightforward domain of inquiry with not too many (types of) social actors involved. Perhaps in comparison with other Dutch sectors it is, but we became aware of what 'relatively simple, straightforward' means in the Dutch context. Even collapsing most actors into categories, such as 'breeding associations' (19), riding (± 1000) and training (± 720) establishments and 'riders and amazons' (± 500,000) and only admitting such organizations as were directly relevant to directing and managing knowledge generation and exchange, we could not count less than 32 relevant social categories and actors. It made us aware of the need on the part of the research team, for more sophisticated software in order to handle such data as a 32x32 integration matrix for the analysis of knowledge networks. Unfortunately we did not have the means to acquire or develop such facilities.

The second lesson was about participation. Beforehand, we were sceptical about the enthusiasm of the actors' representatives to participate in the two workshops. Very busy people all of them, we expected little motivation to spend one and a half day of their precious time discussing knowledge management. We met with great interest instead. Most actors who did not participate, did so because the dates were incompatible with their already set agendas. And 17 participants actually did participate, most in both workshops. Later, we learned this was a common aspect of RAAKS exercises: the social organization of innovation arouses great interest when well-respected actors from the sector take the initiative to put it on the agenda. In the end, our problem was not how to deal with lack of participation, but to assure the participants would not regret their participation afterwards. In the case of the horse husbandry sector, most participants left the second meeting with a firm commitment to discuss the report within their own circles and see what else could be done to improve the way innovation was socially organized in their sector.

Even if, by 1990, we had grasped the importance of a 'soft systems' perspective, initially we underestimated the relevance of our definition of 'horse husbandry'. It were the social actors themselves who taught us the appreciative dimension of the social organization of innovation in a practical manner. They appreciated the three 'blood lines' as structural

forms and underscored their relevance from the point of view of performance of the whole. They also agreed however that impairments could result from accepting these social border lines too uncritically. The RAAKS study helped all of us to look at the 'blood lines' as a matter of design, rather than a matter of fact. Besides, it convinced us as researchers, that RAAKS would have to accommodate various parallel volitions at the time. During this study, we had implicitly extrapolated the IKC mission statement to a general one for the whole: *to make sure all actors within the theatre have access to all relevant knowledge and information at all times.* We discovered that such a general statement of purpose does not do justice to the diversity in even a relatively small sector like the horse husbandry sector in the Netherlands. Not everybody needs everybody else's knowledge and information. Breeders can do without a lot of the information actors from the hippic sports 'blood line' produce, and vice versa! Nor do they need all the information those engaged in horse racing need to have at their disposal. The 'million dollar question' is *which* knowledge and information, from *whom*, is useful to *whom*? This confirmed the need for multiple thinking, allowing for a variety of missions to be chased and accomplished within an innovation theatre at the same time, rather than to assume a single whole with one general mission. It also confirmed the usefulness of the concept of 'synergy', not as a standard or as a uniformly desired state of affairs, but as a design criterion suggesting possible benefits from improved social learning among social actors who recognize mutual interdependence.

In hindsight, a drawback of the study was our failure to push through to strategic commitments, and to monitoring achievements in phase C, firstly, because it was not in our brief to do so and secondly, because we had not gauged its importance fully enough yet. Also, the recommendations made by the study would have to be implemented first to create a platform, such as a renewed CvO, to facilitate adjustments and monitor the implementation of such agreements. At the time, we were satisfied with the enthusiasm of the participants and their firm intentions to take the report of the study to their respective organizations and put it on the agenda. But the question remains: how far should a participatory diagnosis push towards visible results, rather than stop at formulating practical recommendations? Should follow-up not be left entirely to the actors themselves once certain feasible routes for improvement have been identified? It remains a question mark in my mind to which I will return later on (chapter 10).

We concluded that RAAKS as an approach had been successful. We appreciated its strength in making explicit the way social actors organize themselves for innovation, the constraints and opportunities which emerge as a result and the enthusiasm with which so many social actors related to the exercise. We understood that for the successful application of RAAKS, the initiative and backing of at least one respected stakeholder in the theatre was fundamental. Furthermore, the definition of the domain of inquiry had to be taken very seriously during the formulation of the appraisal objective and had to receive continued attention during each study. Finally, we concluded there existed a number of loose ends, particularly with respect to phase C and the specification of our intentions for monitoring or intervening in the implementation of follow-up activities.

9.3 Strengthening agricultural institutions in Central America

The Regional Programme for Strengthening Agronomic Research on Grains in Central America (PRIAG: Convenio CORECA/CEE/IICA) is a joint programme of six different countries to improve the fate of national basic grain producers in view of structural adjustment and regional market liberalization. The programme initiated a regional working group in 1991 to look into the possibilities to strengthen agricultural institutions. Besides this working group, others looked at improvement of training and education, farming systems research and the role of non-governmental organizations. The main objectives of the working group on institutional strengthening were (a) to identify strategies and mechanisms able to propose the organizational, administrative and institutional modernization of agricultural research and extension in each country and in the region as a whole, and (b) to analyze the loss of potential due to changes in institutional resource allocations of the organizations dedicated to research and extension in basic grains, as a result of the structural adjustment programmes and the fiscal crisis. Secondary objectives were (1) to share experiences with respect to institutional restructuration processes, (2) to identify strengths and weaknesses in the management of generation and transfer of agricultural technology, (3) to generate an updated diagnosis of the human, physical and financial resources dedicated to research and extension in each country of the region, (4) to inform and motivate regional and national decision-makers and financial institutions active in the region with respect to the proposals the Group will forward, and (5) to exchange information and experiences with the Central American Group on Training and the Study Group on Non-Governmental Organizations (Grupo Regional de Fortalecimiento Institucional, 1992).

I do not intend to even summarize the multiple activities of the programme or the working group here. The above just serves to draw very roughly the context within which the RAAKS exercises in Central America were done. Those participating in the programme had agreed that the social organization of innovation was to be scrutinized thoroughly and that proposals for concrete actions were to be generated and implemented. A joint management structure to implement the studies and eventually negotiate the proposals had been created and operating costs had been budgeted. RAAKS was to contribute to quickly identifying current impairments and opportunities for improvement, but it was by far not the only activity. Preceding RAAKS, for example, the group had already realized an analysis of *national* technology generation and transfer systems, mostly focused on the availability of resources to attend the research and extension needs of basic grain growing areas. Moreover, the existence of an international collaboration programme meant that the quality of the national staff assigned to the working groups, and hence to RAAKS, was extremely high. All were top level professionals in their fields, most had hands-on experience with rapid rural appraisals or similar techniques and most had a keen interest in the social organization of innovation, even when they never labelled it as such, and caught on to knowledge systems thinking very quickly. I just hope I caught on to their ideas as quickly as they did to mine.

RAAKS' introduction and training of research teams

After an introduction to the knowledge and information systems perspective and the methodology during its second meeting in September 1991, the Regional Working Group decided to include RAAKS exercises as part of its activities in the basic grains producing

areas selected as pilot areas for the programme. Its first purpose would be *training*. The group intended to create a regional network of professionals able to study research-extension interaction and the role of producers and agro-industries in generating and exchanging basic grains technologies, using modern conceptualizations and evaluation methods. RAAKS was to provide a basis from which national teams could develop their own approach. In addition to training, the aim was to gain insight in the actual situation in the different areas by performing a detailed *analysis* of the social organization of innovation. Furthermore, in accordance with the RAAKS methodology, the teams expected to formulate *concrete proposals for action* in the areas in order to improve knowledge and information management with an eye on improving the socio-economic position of the small-holder families who form the majority of basic grains producers.

#	*Country*	*Case studies/areas*	*Research teams*
1	El Salvador	1.1 Zona 5, R.Oriental	Castillo, Guardado, Sandoval, García
		1.2 Sonsonate	-do-
2	Guatamala	2.1 La Blanca	García, Cifuentes, Rivera, Bolaños
		2.2 Polochic, A.Verapaz	Davila, Rivera, Rivera, Wotzbeli
		2.3 Baja Verapaz	Collado, Adlai
3	Panama	Arco seco:	
		3.1 Portrero	Jaén, Palacios, Gutierrez, Espino
		3.2 Parita-Pesé	-do-
		3.3 Guararé	-do-
4	Nicaragua	4 Pantasma, Jinotega	Espinoza, Cruz, Miranda, Lucas
5	Costa Rica	Brunca, Pacífico Sur	
		5.1 Pejibaye	Zamora, Díaz, Hernández
		5.2 Pto. Jimenez	-do-
		5.3 Changuena	-do-
6	Honduras	6.1 San Francisco de la Paz	Juarez, Lavaire, Vega, Alemán
		6.2 Olanchito	-do-

Box 6: RAAKS case study areas in Central America

In order to familiarize the national teams with the methodology, a first RAAKS workshop was held in San José, Costa Rica, in April 1992. The preparation and organization of the course was in the hands of the Regional Executive Directorate of PRIAG. Consultants responsible for the contents and didactic process of the course were recruited from the Ministry of Agriculture of Costa Rica (Emilia Solis), Royal Tropical Institute/Wageningen

University from the Netherlands (Paul Engel) and the International Centre for Development Oriented Research in Agriculture (CIRAD) of Montpellier, France (Augusto Moreno). The course included an introduction to knowledge systems thinking and RAAKS, as well as a practical exercise with RAAKS in the area of San Carlos in Costa Rica. The course was attended by 15 research and extension professionals from the six countries. By means of an evaluation they indicated being satisfied with the assimilation of the materials offered (80% very good; 20% good). As part of the course programme, each national team prepared national RAAKS case studies in all of the grain producing areas affected by the programme. With the decision to cover all and not just one area per country, the teams extended the implementation of RAAKS beyond its originally planned scope. They considered the study of such relevance for understanding the management of knowledge and information in their areas, that implementing it in only one area seemed unsatisfactory. The Regional Executive Directorate agreed to this view and budgeted the extra costs involved. Members of the Directorate and consultants were assigned to backstopping the national study teams.

The national RAAKS studies were executed in the period April-September 1992. Each national team recruited and trained additional team members from the areas. They prepared didactic and research materials, collected the necessary information and mobilized actors to participate in the workshops. In each case particular adaptations were made to the original RAAKS design to suit local ideas and circumstances (see separate paragraph below: RAAKS use and adaptation). The general layout of the methodology however remained in tact. Box 6 shows the areas in which case studies were carried out, and of which the results were presented and discussed during the second regional RAAKS workshop in San José, Costa Rica, in October 1992. Because of the interest the exercise had raised, additional staff, all national team members, were allowed to participate so that now the total number of participants was 22. The workshop addressed three main elements. At first we concentrated upon defining and discussing the main issues which affected institutional performance in support of basic grains production in Central America. The relevance of each issue regarding the formulation of proposals for intervention was evaluated. Criteria for judging useful proposals were discussed. Secondly, each country presented the outcomes of its RAAKS exercise(s) and these were reviewed and commented upon by the group. A detailed evaluation of the national teams' experiences with RAAKS and their opinions as to the added value and applicability of the methodology concluded this part. Thirdly, each national team elaborated action proposals to be presented to the Regional Executive Directorate and national level policy makers for implementation.

Some results: appreciating the social organization of innovation in practice

It is utterly impossible to do justice really to the richness of results presented by the RAAKS teams after their studies. The variety and depth of their insights and observations with respect to the domains they studied fully justifies the over 300 pages of text and graphics they produced (Castillo & Guardado (a,b), García et al., Davila et al., Collado & Adlai, Jaén & Palacios, Espinoza et al., Zamora et al., Juarez & Lavaire (a,b), all 1992). Within the scope of this book I can only scratch the surface and mention some of the most telling examples of what they brought out during the second workshop we held, after all of them had finished writing their preliminary reports. Beforehand I apologize to all of the team members for my crude selectivity. I do not know a better way. Below I

will first discuss the general problem focus and discussions which were held, then I will cite some examples of constraints and opportunities for improving innovation in basic grains production and finally I will present some of the recommendations for action which were formulated eventually.

The RAAKS exercises helped the national teams focus on the social organization of innovation quickly. The priority issues proposed to the second RAAKS workshop reflect this focus (see below). To claim that only with the help of RAAKS such elements come out would be foolish, but RAAKS' analytical focus is recognizable and seems to have contributed to specifying the issues. Existing diversities, in interests and strategies and resource availability, are recognized; differentiation of tasks, linkages, and other structural elements are pointed to, as well as their influence upon the generation, validation and transfer of technology and the management of knowledge and information; the relevance of the policy environment is underscored; and finally, local knowledge networks and peasant knowledge are recognized as part of the problem *and/or* the solution.

Priority issues with regard to the social organization of innovation for basic grains in Central America (proposed and selected by the participants of the second MSICA workshop, October 1992)

1. *Inter-institutional coordination:* linkages between extension and research; tasks exist without social actors to perform them as well as social actors without tasks.
2. *Knowledge and skills of the producers:* the integration of farmer knowledge with scientific knowledge; producers lack organization; the role of producers in the generation, validation and communication of technologies; non commercial producers lack support; local, empirical knowledge networks are to be taken into account.
3. *Types of producers, specific situations in relation to interventions:* diversification and the changing role of basic grains; diversity in producer/production strategies - not everybody produces the same way or for the same purpose; survival strategies and food security with basic grains; capitalize upon the experience producers already have with respect to alternative crops/activities.
4. *Structural adjustment and the elaboration of interventions:* market liberalization; open borders; privatization of technology generation, validation and transfer.
5. *The role of women in the (management of the) knowledge and information system concerning basic grains:* division of labour at the farm level; knowledge networks among rural women to be taken into account; exchange of knowledge and its relation to gender.
6. *The current configurational transformation of the basic grains knowledge and information system:* transfer of initiative from state to market; it is necessary to look into (formal) networks which have outlived their function; new tasks versus tasks without social actors to perform them; the role of non-governmental organizations in rural development; strong influence of

donors/international financial institutions upon the knowledge and information system; the influence of agro-commercial organizations.

7. *Natural resources, basic grains and sustainability:* basic grains production and diversification have to be looked at from an ecological point of view as well, not only socio-economical.

The results of the studies also reflect insight into the social organization of innovation. The producers themselves are recognized as an important source of knowledge and information, as are agro-industries, commercial companies, seed producers, traders, etc. Most studies call attention to the fact that different types of producers network for innovation differently. Jaén and Palacios (1992), for example, demonstrate how in the Arco Seco area in Panama, subsistence farmers and those who sell most of their produce on the market participate differently in existing knowledge networks and, as a consequence, obtain information differently. In general, socio-economic relationships influence networking greatly. The same authors report that the exchange of information between subsistence and commercial farmers occur because the former sell their labour to the latter. Castillo & Guardado, (1992a,b) show that network configurations differ considerably if those for basic grains are compared with those for animal husbandry and export crops. Depending upon the type of actors involved in each line of production, the type of land ownership, labour relations, credit and/or commercial arrangements and the exchange of knowledge, information and experience are organized in a different manner.

As most other authors, Castillo and Guardado (1992a) report a number of environmental factors which affect the social organization of innovation in Zone 5, Oriental Region, El Salvador. They mention lack of credit and resource deterioration, uncertainty with respect to land tenure and adverse agro-climatological conditions. More specific to their area, they identify the paternalism that dominates the relationships between both government institutions and non-governmental organizations and their resource-poor clienteles. Finally, they propose that the influence of resource transfers from family members abroad to the population in the area is so strong that it has changed the way of life of the people. Therefore, remaining small-holders have little interest in taking the risks implied in growing their crops and labour has become scarce and expensive. Such a description contrasts strongly with that in the Sonsonate area where the same authors report that despite many and severe difficulties, the producers cultivate and stay alert and receptive to efforts of government and non-government institutions to promote improvements. But, unfortunately, this environment provides "... a strong policy support (...) for export crops not for basic grains" (Castillo and Guardado, 1992a).

A number of studies express serious doubts as to the effectiveness of government institutions in attending basic grain producers. Basic grains production, Castillo & Guardado (1992a) argue, rests with small-holders who have little access to resources, lack credits and suffer from an unstable market. There exists no plan to attend to their needs and the ones who are supposed to do so, the extension agencies, lack the necessary resources. Systematically, it appears, research and extension programmes focus their efforts at producers who have better access to resources and/or credit. Jaén & Palacios (1992) also argue that technical packages have not been developed to fit the needs of subsistence farmers, who represent 70% of the basic grain producers in their area, and information reaches them only indirectly, through contacts with other farmers or

sometimes, local traders. These in turn receive most of their technology and information through representatives of multinational companies who sell inputs and/or services. As a consequence, knowledge on basic issues such as improved varieties and their adaptation, integrated pest management, cultivation methods, etc. is relatively poor among resource-poor farmers. And so is, vice versa, the familiarity of extensionists and researchers with their practices and their particular circumstances. In summary, public institutions often play a secondary role at best in technology transfer to the majority of basic grain farmers.

Coordination between public institutions is often weak. Juarez et al.(1992a) conclude that even when the Natural Resource Secretariat can be considered the leading agency, it is not able to impose coordination among relevant institutions effectively. The instances in which coordination is achieved seem to occur when international agencies exert their influence through resource incentives and training. Espinoza et al. (1992) also point at the lack of coordination in the Pantasma Valley in Nicaragua. Collado & Adlai (1992) describe inter-agency competition for attending the communities closer to town, leaving the majority of the population without assistance. Lack of coordination, they report, provokes duplication of efforts and lack of impact, among both government and non-government agencies. Castillo and Guardado (1992b) argue that the producers themselves are the most important driving force behind the social organization of innovation in basic grains. Despite resource limitations, they produce for their own consumption as well as for the market. Among the producers an empirical knowledge network operates, traditional but practical, based upon their own knowledge and experience and complemented with technical messages from other actors. This view coincides with the one expressed by the farmers in the Pantasma Valley, who pointed out that the transfer of technology and information between themselves was the most frequent and most effective (Espinoza et al., 1992). Most studies recognized that the key to innovation in basic grain producers in Central America is in the hands of the producers themselves. Institutions which intend to help ought better recognize this.

Davila et al. (1992) asked various groups of actors in Polochic Alta Verapaz to picture the innovation theatre as they perceived it. Each group elaborated a drawing for maize, rice and animal husbandry, detailing in each case the links for exchanging knowledge and information on technology, credit and marketing separately. It is interesting to observe, they argue, that different groups present entirely different views of these articulations. For example, while the representatives of government institutes painted a fully integrated system for animal husbandry with connections between all eight actors considered relevant, the private sector representatives articulated only three: the intermediary, the land owner and the peasant. Using this approach, these authors focused directly on the appreciative character of the social organization of innovation, and made it an issue for discussion amongst the social actors involved. On the contrary, Espinoza et al. (1992) presented their own well-probed graphic impression of the social organization of innovation in the Pantasma Valley to the workshop at the end of phase A. During the discussions the local producers were of great help in making the distinction between institutions seemingly present in the valley and those that were really active among them. But the producers corrected the team's view as expressed in their drawing on one important account: they indicated communication from producer to producer was probably their most important source of knowledge and information, so they had to include it in

their system drawing (Espinoza et al., 1992). The Nicaraguan team, also, singled out the enthusiasm displayed by the local authorities to follow-up on the exercise.

Moreover, Espinoza et al. provide a vivid account of the different missions with which actors pursue agricultural innovation in the Pantasma Valley, Nicaragua. As a result, they argue, there exists no 'common language'. While the National Development Bank, who traditionally financed basic grains producers, speaks of efficiency in the use of credit and has abolished all subsidies, the producers, who find themselves close to being marginalized from economic activity, consider it as one possibility to survive the current crisis and as a subsidy to guarantee their subsistence. The producers speak of the need to establish guaranteed prices, while the government is bent on eliminating all interventions in the market mechanism. The producers speak of reducing the use of technology as a strategy for subsistence, while the Ministry of Agriculture and Livestock and the National Centre for Basic Grains Research speak of elevating the use of improved technologies and the modernization of production. The Ministry and the National Centre also speak of augmenting production and productivity in basic grains, while the producers talk about changing over to other more profitable activities - even when they continue to grow grains for subsistence. The Union of Agricultural Cooperatives, finally, expresses the need to extend the agricultural credit programme, while PRODERE, the programme in support of refugees and the repatriated, wants to support small-scale technological demonstrations with a selected group of farmers. Despite their differences, the authors stress the cordiality which was established between the actors during the seminars which permitted a thorough analysis of the causes and consequences of the situation (Espinoza et al., 1992).

García et al.(1992) drew out the differences in appreciations among different types of stakeholders by asking them to prioritize the problems affecting production in the La Blanca area. The social actors participating were farmers, advisers from government institutions, private advisers, and the regional directors of agricultural institutions. All but the group of directors agreed that low prices and lack of marketing channels for maize and rice was the top priority problem. The directors, on the contrary, pointed to the individualism of the producers in facing the current situation as the number one priority problem. On the other hand, the high cost of fertilizers, ranked second by the producers, was ranked fifth or sixth by the other actors. Untimely credit delivery, surprisingly, was ranked higher by government technical advisers and directors than by farmers. In the eyes of private advisers, it only deserved the eighth place. Lack of knowledge of the existence of a laboratory for soils and phytopathology in the region and lack of research and technical assistance on grains production came in second or third among all. While the farmers and government officials agreed on a lack of information on improved technologies in horticultural crops and grains, private advisers ranked this very low on their priority list.

Towards concrete actions for improvement

When discussing the above results during the workshop in order to define possible solution strategies, it became clear why the group of Directors had thought differently about what the top priority problem was. From the opinions expressed it followed that most actors were tempted to focus their recommendations for improvement on the strengthening of the National Institute for Marketing Agricultural Produce (INDECA).

The Directors disagreed however. They explained that according to their information, this particular institution had just changed its policy and would not engage in marketing grains any more. For this reason, their appreciation had been to indicate the lack of organization of the producers (to do their own marketing) as their top priority. After this explanation, the whole group recommended to seek the promotion of marketing organizations among producers and to offer training to farm leaders in the management of such activities. This led to an interesting discussion and eventually to an agreement among these actors and INDECA to meet within one month to discuss concrete options for improving the grain marketing situation. INDECA offered training for those who wanted to set themselves up as entrepreneurs and committed itself to providing information on grain prices at the national level. The producers agreed to participate actively in the courses (García et al., 1992).

Castillo and Guardado (1992b) report the same need to improve marketing of basic grains in the area of Sonsonate, El Salvador. During the study, different options to materialize such a recommendation were evaluated. In this case also, the establishment of producers' organizations with the help of non-governmental organizations or financial institutions was considered to be more realistic than trying to reactivate an already closed and soon to be privatized government institution which fulfilled this function in the past. It serves to illustrate that marketing practices may be one of the main constraints to innovation in many situations. In this case the farmers put forward another very concrete option as well. They informed the team of the experiences of some farmers in the area who used botanical products for pest and weed control with some degree of success. Apparently, it had helped them to reduce costs significantly. They proposed that CENTA, through its research division, contact these farmers, validate their experiences and, if relevant, make it known to other farmers, not only in this area, but nationally (Castillo and Guardado, 1992b).

From the results of the RAAKS studies it becomes clear that the situation of the majority of basic grains producers is critical. They are caught between a government withdrawal and market liberalization. They are affected by the decision of the governments to refrain from direct intervention in agriculture, while as yet no cost reducing technologies, promising alternatives or adequate forms of organization are available. In this situation, the participants and teams came up with diverse and location-specific recommendations. In each situation they try to build upon local strengths and opportunities, rather than to construct a 'standard package'. Particular characteristics of the social context in each of the regions were considered, such as the active involvement of municipal authorities in Nicaragua, the possibility to reinforce institutional intervention and coordination in Honduras, or the reflection upon the possibilities for agro-tourism in Costa Rica.

Nevertheless, three currents of reasoning seem to lie at the core of many of the proposals: (1) in Central America today, commercialization is a key factor and is to be strengthened, as without market incentives innovation in basic grains is hardly conceivable, (2) farmers themselves hold many of the keys to innovating basic grains production, they have to become more actively organized to search for new options and new solutions to the variety of problems they face, and (3) government institutions are no longer the main driving force behind basic grain development, so they are to reorient their policies and

coordinate with others, such as farmer and non-government organizations, private companies, municipal authorities, to allocate their limited resources more effectively.

Proposals to strengthen innovation through *commercialization* range from a proposition by private actors to create an integrated agro-industrial chain for maize coordinated at the municipal level (Pantasma Valley, Nicaragua) to the construction of stores ("centros de acopio") between farmers, non-governmental organizations and financial institutions (Sonsonate, El Salvador). A more efficient credit delivery system, specifically oriented towards basic grain producers, is often mentioned as a fundamental requirement. The Costa Rican team's proposals are directed at achieving a reduction of on-farm production costs, as well as at an increase of product quality and added value. Financial support, adequate infrastructure, on-farm research and farmer training are mentioned as necessary ingredients of such a programme. With respect to *farmer organizations* the teams are quite explicit. Since no special protection or subsidies can be expected under the present circumstances, the farmers themselves have to play an active role in organizing not only the marketing of their produce and credit and services delivery, but their search for alternative technological solutions as well. Training of farmers, again, is considered a fundamental requirement.

As it appears from the studies, the government institutions' role is really in flux. In the case of Panamá, a review of institutional policies on research, extension and credit delivery is suggested (Jaén and Palacios, 1992). Generally, recommendations with respect to institutional practices emphasize three issues:
(1) The need to re-orient agricultural research to the specific circumstances of basic grains producers, seeking to reduce production costs to a minimum, making use of local experiences and advantages to the maximum, and looking for promising alternatives for diversification. Active participation of farmers in on-farm research is seen as the best way to integrate locally available and new scientific knowledge.
(2) The need to recognize different types of basic grain producers and to adapt and equip agricultural extension adequately to deal with each type. Improved extension planning and programming, staff training and active farmer participation are recommended.
(3) The need to improve inter-institutional coordination and where possible, to involve 'new' actors such as local authorities, private companies, farmers organizations and non-governmental organizations. The need to improve the exchange of information among relevant stakeholders is brought forward in both Nicaragua and El Salvador (Region Oriental).

RAAKS in Central America: its use and adaptation
During the final regional RAAKS workshop in San José, Costa Rica, looking back upon their experiences, the research teams confirmed that indeed the first workshop and practical exercise had been successful in clarifying the approach and methodology of RAAKS, even though the number of unfamiliar concepts had been large. Remaining doubts were mostly straightened out within the team or with the help of the consultants from the Regional Directorate. Nevertheless, most teams pointed out that additional practical training concerning the use of windows and tools would have been helpful. Additional documentation and reading materials would have been welcome as well. Furthermore the teams considered the lack of training in workshop design, preparation and management, including group dynamics, participation and communication, a serious

drawback which led to much improvising. In practice, this had been overcome with the help of the consultants.

Initial workshops were held in which the national teams trained additional members in order to perform case studies in all areas of the programme. Eventually a total of 14 case studies were executed in six countries (box 6). Each RAAKS team was allowed to make adjustments befitting their particular circumstances within the scope of the methodology. The identification of relevant actors was normally done by seeking key informants from relevant practices, organizations or institutions. In two countries, a random sample of producers was taken to determine which farmers were to participate in the exercise. In Panama, this was particularly useful because the team had recently done an agro-socio-economic survey so that the farmers from the same sample could be approached and its information fed into the RAAKS analysis. In Nicaragua, the actors themselves pushed for a more thorough commitment to the results of the exercise, establishing a committee including one technical specialist from the public domain, one from the private domain and two farmers to help consolidate the results and carry the proposals for action to the municipal technical committee.

Mostly the teams implemented the windows as proposed in the manual, using the tools specified beforehand. Only the window on communication analysis was not used regularly. The reason was that the distinction between integration and communication analysis had not become clear enough. But a number of additional tools were designed and used as well, such as specified interview guides and matrix tables for organizing and synthesizing information and for planning actions in phase C. Two teams combined the information on window B3, knowledge network analysis, with that on B1, impact analysis, into one matrix. One team did task analysis twice, once for the actual state of affairs and once for the desired state, asking actors to specify the importance they attach to each task in view of the performance of the whole. In most cases the actor workshops were reduced to two, one for phase A, one for B and C together. In Guatamala all three workshops were held, one for each phase in RAAKS. The workshop designs were varied. Often different types of actors were given time to discuss their reactions to the information and possible improvements within their own groups first. This proved a promising way of preparing a balanced 'negotiation of interpretations' for the plenary sessions that followed.

Usefulness of RAAKS in the eyes of the national teams

During the final workshop and evaluation of the RAAKS exercises, the teams were also asked to specify the added value of RAAKS in their situations. Without exception, the teams were of the opinion that RAAKS had permitted them to focus on the social organization of innovation quickly. They pointed out the methodology facilitates a meaningful analysis of events and ideas from a new angle in a participatory and reflexive manner. Human actions, or agency ('gestión humana'), is at the centre of its analysis. It permits the acquisition of new knowledge as well as the sharing of information which was only partially available with some actors (El Salvador). RAAKS widens the vision of the actors with regard to the identification of constraints and opportunities; also, it helps include the identification of the knowledge and information systems thinking in a more general systems approach (Guatamala).

> "The method permits one to orient and structure information gathering better and to formulate integrated plans of operation with participation of the different actors involved" (the Guatamala national team on RAAKS' applicability).

The teams confirmed that RAAKS permits a thorough analysis of a domain of agricultural knowledge and to determine quickly the levels of integration and coordination between the different actors involved (Panama). As it treats aspects which are not common in traditional agro-socio-economic surveys, it permits discussing and solving drawbacks in communication, coordination, integration, task performance (Nicaragua). As RAAKS permits reaching a shared understanding of problems and hence to plan solutions jointly as well, it facilitates active and conscious participation of actors. The Nicaraguan team observed *RAAKS helps create an atmosphere of cordiality even among antagonistic and indifferent actors*; as a consequence, responsibilities for interventions are assumed by more than one actor.

> "In areas such as Nicaragua where one experiences a change in the economic, social and political order and where the majority of the actors, when left to themselves, are not capable of (fully) interpreting and linking the effects of exogenous factors, such as sources of finance and the market, the method has a practical applicability of incalculable value" (the Nicaraguan team on the applicability of RAAKS).

RAAKS generated interest and active participation among actors, helped identify problems and opportunities which had been left undeclared; both in El Salvador (La Blanca) and Nicaragua (Pantasma Valley), *the actors proposed and engaged in a more formal commitment than was proposed initially within the scope of the methodology*. Also, this was the first time that producers of basic grains participated in the analysis of their own situation, while it contributed to creating 'group consciousness' among team members and provided the local team with more credibility with regard to what they are doing (Costa Rica). Finally, the Costa Rican team pointed out that the exercise had left technical specialists with burning questions ('inquietudes') as to the importance of knowledge and information for agricultural development.

> "In the present study we did not only interview producers but also leaders of farmers organizations and professional associations and persons from public and private institutions. RAAKS helped us identify weaknesses and strengths in many actors which the agro-socioeconomic diagnosis did not bring to light: aspects such as communication, integration, coordination and specific missions, to improve the system as a whole and not only the generation and transfer of technology in particular" (the Panama team on the added value of RAAKS in comparison with agro-socio-economic diagnosis).

Finally, the teams summarized their suggestions for improving and further developing the methodology for use in the Central American region. They reconfirmed the importance of validating the results on the social organization of innovation with the stakeholders themselves and underlined the need to be careful to integrate *small* producers in the workshops. The need to understand and deal with diverse missions at the time, all relevant to judge the performance of the whole, had to be addressed more explicitly when

tracing mission statements. Historical roots of current problems should be considered more explicitly as part of the window on environmental analysis. A suggestion was made to distinguish between a 'mandate' for the whole and 'missions' as the more informal intentions and strategies of (combinations of) individual social actors. Finally, they suggested that the analysis of institutional capacities could be strengthened in actor potential analysis, for example by including reference to farmer/field worker ratios.

The teams made it clear that in spite of the detailed suggestions for improvement, RAAKS should not become a rigid, blue-print methodology. Its flexibility was recognized as one of its strengths and should be maintained. Even so, criteria for delimiting information collection and for making an adequate selection of windows to be used in phase B, can be elaborated and included. The steps to be taken in each phase can be indicated more precisely and suggestions for organizing and managing the workshops can be given. And if possible, some suggestions can be made with respect to the formats of intermediary and final reports. Phase C may be strengthened by more specifically outlining the procedures for guiding negotiations and decision-making on proposed actions. Decision-makers themselves may be involved more actively. And more documentation can be provided. All teams proposed to continue using and developing the methodology in their countries. As the time and cost involved was relatively high, its use was recommended in those situations which justified particular attention, for example in agricultural, agro-forestry or rural development projects, in 'new' programme areas and in strategically important sectors in which the social organization of innovation proved particularly problematical.

Concretely, the teams asked the Regional Executive Directorate to support the follow-up of the activities proposed by the teams, and suggested further training at the national and regional level in the use of the methodology to form a regional network of RAAKS consultants. They suggested the publication of national reports and the continued sharing of experiences and information between the teams with respect to RAAKS and other activities of the programme. Finally, they challenged the consultants and Directorate to elaborate and publish a practical manual on RAAKS and to make available other documentation on knowledge systems thinking and related issues.

Some critical issues and lessons learned

The use of RAAKS by such a varied group of agricultural professionals as took part in the 14 case studies in Central America, was an enormously enriching experience for all of us. No pen can adequately describe the learning dynamics involved. Still, I will try to highlight some of the central issues that came up and some of the lessons we learned. One of the first things that became clear is that RAAKS actually 'works'. We had no difficulty agreeing that the methodology is applicable and made a valued contribution to achieving the programme objectives formulated (training, understanding the social organization of innovation in the areas and identifying opportunities for action; see above). Also, on the basis of the above, it is not difficult to argue that RAAKS fulfilled its own operational objectives (to identify opportunities for action, to create awareness among relevant social actors and to identify actors which can take action adequately; see p. 8-14).

RAAKS permits the research teams to collect information and derive an understanding of the social organization of innovation. Its validity as an appraisal methodology has been

confirmed. Also, it adds value to more traditional appraisal methods, such as the agro-socioeconomic survey, by focusing on relationships between social actors and the capacity of social actors to enact networking strategies in order to fulfil their expectations. Moreover, its flexibility in terms of intentionality, analytical and procedural design has been singled out as a reason for its successful adaptation and implementation. Each team could develop its own style ('estilo propio'). Furthermore, it shares with other participatory approaches, the active participation of stakeholders, the personal growth, team building and group dynamics among researchers and social actors so characteristic for this type of methodologies. Finally, it helped motivate a large number of people to look at their world from a different angle and appreciate some of the problems in a new way. Doing RAAKS served as a catalyst to their enthusiasm.

However, we also learned that, without a team of highly qualified professionals, all of this would probably have been unattainable. By quality I do not refer to competent performance in one of the traditional disciplines as such, but to the capacity to step back and critically appraise one's own role and that of other relevant actors in the social process called agricultural innovation. This requires an ability to engage in appreciative systems thinking, stressing wholeness as well as diversity, individual opportunities as well as structural impairments, and to see human and institutional purpose and decision-making as part of the problem as well as the solution. Moreover it requires an ability to work in interdisciplinary groups and to relate easily to farmers, industrialists, traders, private advisers, policy makers, etc. And it requires an open mind to appreciating the reasoning of others.

Another crucial element has been institutional support. In most countries, national institutions were committed and supportive. The Regional Executive Directorate, through finance and direct support enabled the teams to accomplish the training, field research and workshops in time and provided a framework for preparing and planning follow-up activities. RAAKS is no exception to the rule that every exercise requires time, energy and money. Even though the period is relatively brief, in this case five to six months of part-time activity for most involved, the time will have to be taken away from other activities. Moreover, the wrestling with new concepts and appreciative issues takes a lot of energy, probably more than is required for doing one's regular job. And finally, the training, the workshops and, generally, the involvement of so many social actors in the process costs money. It may not be that much, but it has to come from somewhere. Without the active commitment of at least one well-respected organization or institution to complete a RAAKS exercise comprehensively seems impossible.

This is the more true when we consider that RAAKS involves the active collaboration of relevant social actors, not only in the exercise but also in implementing (some of) the recommendations. The participation of such actors will depend in part upon their appreciation of the organization or institution which takes the initiative. Moreover, to achieve a balanced selection of social actors to take part will somehow depend upon the views of this latter actor as well. That organization may have a particular view about who the other relevant actors are which might, or might not, coincide with the views of other actors. Therefore, the actor or actors that take the initiative to initiate a RAAKS exercise need to be open-minded and committed to the aim of studying actual practice and be willing to challenge their preconceived ideas of what the social organization of innovation

may look like. This reconfirms the relevance of phase A, particularly with respect to the redefinition of the appraisal objective, the identification of relevant social actors and the search for diversity in missions, and the active participation of the initiating social actors in this phase.

Another conclusion which was brought home strongly by the teams was the lack of training and documentation they received initially with regard to the management of the participation and communication processes involved in RAAKS. In version three, of the three intertwined learning processes RAAKS entails (cf. p. 8-13), we had emphasized the joint inquiry into the social organization of innovation and the multiple perspectives, apparently at the expense of the more task-oriented social learning process and the communication, group formation and dynamics it entails. This was a suggestion we took up for the next version of the manual, in which we included some text, and exercises to facilitate interviewing, communication, team building and management of participation, as well as suggestions for organizing the workshops. We also specified more precisely the steps to be followed during each phase and described the intermediary and final outputs in greater detail. We took care, however, to avoid rigid lists of guidelines and presented the issues in a narrative form and by means of exercises and examples. We also concluded that in the initial training of RAAKS teams, communication and team building had to be given explicit attention.

We also recognized that phase C had to be reviewed critically again. During this phase, two possibly conflicting intentions come to meet. On the one hand, all actors need to participate freely in order to redefine problems and solutions, on the other they need to arrive at tangible conclusions and a commitment to action. The first requires an open mind and inclusive thinking, the second requires strategic thinking and the elimination of alternatives that do not receive substantial support. This convergence upon solutions, to be meaningful and practical, needs the participation of decision-makers, for example as a separate subgroup during (part of) the workshops, as suggested by the team from Guatamala. However, in a case where consensus on specific actions can not be reached, it seems unwise to persist in seeking it at all cost. Generally practical alternatives will be conceivable which may not receive the support of all, but do catch the interest of an important number of the stakeholders. Nothing should stand in the way of actors who decide to (re)group themselves in several subsets and to work out what they see as the most viable way to improve the social organization of innovation. This process, however, is not necessarily an integral part of a participatory diagnostic process such as RAAKS. It seems to me, the need to create consensus on concrete solutions should not interfere with the possibility to achieve a joint appraisal of actual problems and possible solutions.

Finally, one is left with the feeling that the relative success of RAAKS is at least partly due to the fact that it is unfinished. There remains much to be desired and to be developed. For that exact reason, it seems, it allows every team to develop its own style. If that were true, and I think it is, it would definitely have to remain that way.

9.4 RAAKS as an appreciative learning system

In this paragraph, I may finally try to answer my research questions Q4, on RAAKS' performance as a methodology, and Q5, on its potentials and limitations in practice. The objectives and criteria formulated laid down in chapter eight (8.3, 8.4, 8.5) are the starting point for defending RAAKS' efficacy as a methodology; our varied experiences with RAAKS or parts of it, are the basis for evaluating its use and applicability; and its close relationship to current methodological developments will provide me with a framework to argue its relevance to development practice. I do not pretend my answers to be exhaustive or all-inclusive, but I do think our experiences and materials provide a basis for suggesting that RAAKS works in practice, that it provides a means to stimulate meaningful discourse on the social organization of innovation among stakeholders and helps to design ways to improve it. With this, RAAKS represents a promising new approach to stimulate and/or create platform processes. In complex innovation theatres, it offers a practical and participatory approach to achieving a shared understanding of complex problems, a diagnosis of key factors and an agreement on what could be done by whom to improve innovative performance.

On the efficacy of RAAKS

RAAKS design and operational objectives aim at helping social actors (1) improve their understanding of the way they presently organize themselves for innovation, (2) help define a problematical situation in one or various meaningful ways, and (3) identify actors and define actions useful to improving upon it. With no exceptions, the case studies demonstrated RAAKS' potential to diagnose and discuss relevant aspects of the social organization of innovation. RAAKS helps highlight relevant social practices, diversity in views, concerns and interests between relevant social actors, social interaction for innovation and emergent social forms. This leads to the identification of (structural) impairments and opportunities for improvement. RAAKS does not support the analysis of the (technical) innovations themselves, yet concentrates upon the networking and decision-making that goes on with respect to volitions, propositions and conditions relevant to the emergence of (technical) solutions. Therefore it helps study and debate innovation as a *social* process meaningfully. RAAKS demonstrated its strength in making complex problematical situations more transparent and manageable. With respect to the first two elements, therefore, RAAKS fulfilled our expectations.

With respect to the third element, I need to make a difference between two types of outcomes from RAAKS. The first is increased awareness and networking among relevant social actors, the second are specific projects aimed at improving innovative performance among (subsets of) social actors. Again, without exception, the case studies generated the first type of outcomes; not only among the social actors, some of which went much further than originally suggested by the methodology, but among the researchers as well. The RAAKS exercises generate considerable enthusiasm and stimulate intensive interaction. The second type of outcomes is more problematical. To be implemented, in addition to useful ideas, time and energy, projects need financial resources. And RAAKS does not include the resource negotiation as part of the exercise. It does include a negotiation of views, proposals and interpretations, but this must be taken as a first step of identifying concrete proposals. Formulating specific project proposals and carrying these through to implementation is a professional activity in itself and (as yet) not part of

RAAKS. To generate an open-minded, joint appraisal of a complex problem situation that affects each of the participants directly and deeply, and at the same time requires narrowing down the options to proposals which fit the mould of policy makers and funding agencies, I considered implausible. One could perceive this as a weakness of RAAKS, because it provides less control over the implementation of follow-up activities. At the same time, to exclude specific reference to individual short term interests might be one of the clues to its success. The case study materials do not provide conclusive information to argue in favour of either one of these propositions. Only a much more elaborated analysis of follow-up activities in each case may tell. This falls outside the scope of this preliminary analysis.

Our next step is to review whether RAAKS indeed adheres to the suggestions brought forward in chapter eight (8.3). A first suggestion was to include additional theoretical perspectives besides the knowledge systems perspective. RAAKS responds to it by offering different analytical windows within a general design inspired by soft knowledge system thinking. These windows, particularly in phase B, correspond to different theoretical approaches. However, these are by no means all-encompassing. RAAKS windows focus on the social actors, their views, strategies, communication and social interactions with respect to innovation. Networking practices are studied in detail but actual research, extension, farming, industrial and trading practices are merely touched upon. Besides, the technical innovations as such (in the form of new products, artifacts or recipes) receive less attention than in traditional innovation studies. Moreover, RAAKS assumes what I would call a wide-spectrum social organizational approach, emphasizing social diversity as well as mutual adjustments among actors. Modifications are conceivable which increase the use of additional sociological, social psychological and anthropological perspectives in RAAKS. However, for studying the social organization of innovation in practice, I conclude from the materials and experiences presented above that the current mix of perspectives has served its purpose: RAAKS indeed helps focus inquiry and discussions on relevant issues, practices and structural forms of social organization for innovation quickly. It offers a way to engage in meaningful discourse on critical issues relevant to the way social actors are organized for agricultural innovation.

A second suggestion was to create a methodology based on appreciative systems thinking, a form of soft systems thinking more suited to the analysis of complex processes of social interaction and construction. A greater emphasis on actor arrangements for creating systemic images was deemed necessary. RAAKS demonstrated in practice to stimulate soft systems thinking, recognizing that social actors may behave as a system only if they wish to and know how to do it. In addition to the attention for diversity in world views, already implied in soft systems methodology, RAAKS adds explicit reference to diversity in analytical perspectives. Mostly, the windows lead to the construction of *actor* arrangements, images which emphasize particular characteristics of the relationships between relevant social actors, such as inter-connectedness, mutual interdependence, convergence, communication, leadership, coordination, or information and resource transfers. Other windows however focus more specifically on characteristics of the individual actors themselves, elucidating for example their views, strategies, practices and command of resources. A more detailed analysis of relevant practices, for example, seed certification, research, policy implementation or industrial processing, when relevant to the inquiry, could be an incentive to include the use of *activity* arrangements as well. This

would extend the scope of the analysis to decision-making by relevant actors within their respective practices. Studies by Swanson (1986), Kaimowitz (1989) and Westendorp and Röling (1993) suggest such could be a promising line of inquiry. For RAAKS, as a (relatively) rapid strategic diagnosis, this has not been attempted. As it was, our emphasis on actor arrangements sufficed to highlight both networking practices and structural forms of social organization for innovation adequately.

In addition, the soft systems tradition requires RAAKS to be designed as a learning system. The experimental RAAKS exercises clearly reflect this. The process created with the help of RAAKS can be described as an interactive learning experience in which three different, yet complementary, learning processes are intertwined (figure 7). The decision of (some) social actors to do a RAAKS exercise generates a process of information gathering through (group) interviews, structured with the help of relevant windows. This leads to the creation of different images of the situation which are laid down eventually in notes, drawings and field reports. Through a joint inquiry between social actors and researchers, different images, reflecting different points of view or analytical angles, are contrasted with each other during group discussions and workshops, leading to iterative learning cycles among the participants. Individual or group insights into the social organization of innovation may then lead to the proposition of new images, which generally require new information to be understood in detail and presented. Eventually, the workshops and discussions among researchers and social actors lead to validated views and images which can be put into the discussion of possible courses of action. This way, the other learning cycles feed back into the social learning process which is to lead to strategic commitments and decisions to follow-up. This cycle is completed during RAAKS at least three times, during phase A, B and C, each time with different research objectives. However, as the above experiences have shown, none of the learning in RAAKS is such a simple cyclical process. Many sidesteps, jumps and loops, both back and forward, are made. Also, the impetus to social learning generated by the RAAKS exercise is only one additional element in the social learning which is going on between the actors anyway (symbolized by the dotted arrow). RAAKS just provides one specific set of inputs into the much wider social process of learning for organizing innovation. In other words, the drawing is not intended to suggest any undue generalizations by taking it too literally. It just helps to illustrate the systemic nature of RAAKS design and its application in practice.

A third issue is the relevance of participation and negotiation to inquiry into the social organization of innovation. Our experiences show that this is easier said than done. In the cases, participation of social actors was more than hoped for. Nevertheless, the management of the communication and group dynamics that such entails caused many teams to flinch. It proved hard work to plan, prepare and guide the participation process and it required commitment not only from the researchers and actors involved, but also from the institutions which initiated the exercise who had to carry the extra costs in time, energy and money. Moreover, striving for active participation of all brings out into the open the power struggles between the different (subsets of) social actors, as was illustrated by the discussion among both government representatives in the horse husbandry case. On the other hand, the creation of an 'atmosphere of cordiality even among antagonistic and indifferent actors', as the Nicaraguan team put it, apparently lies within the grasp of those using RAAKS. Particularly in El Salvador and Nicaragua, our

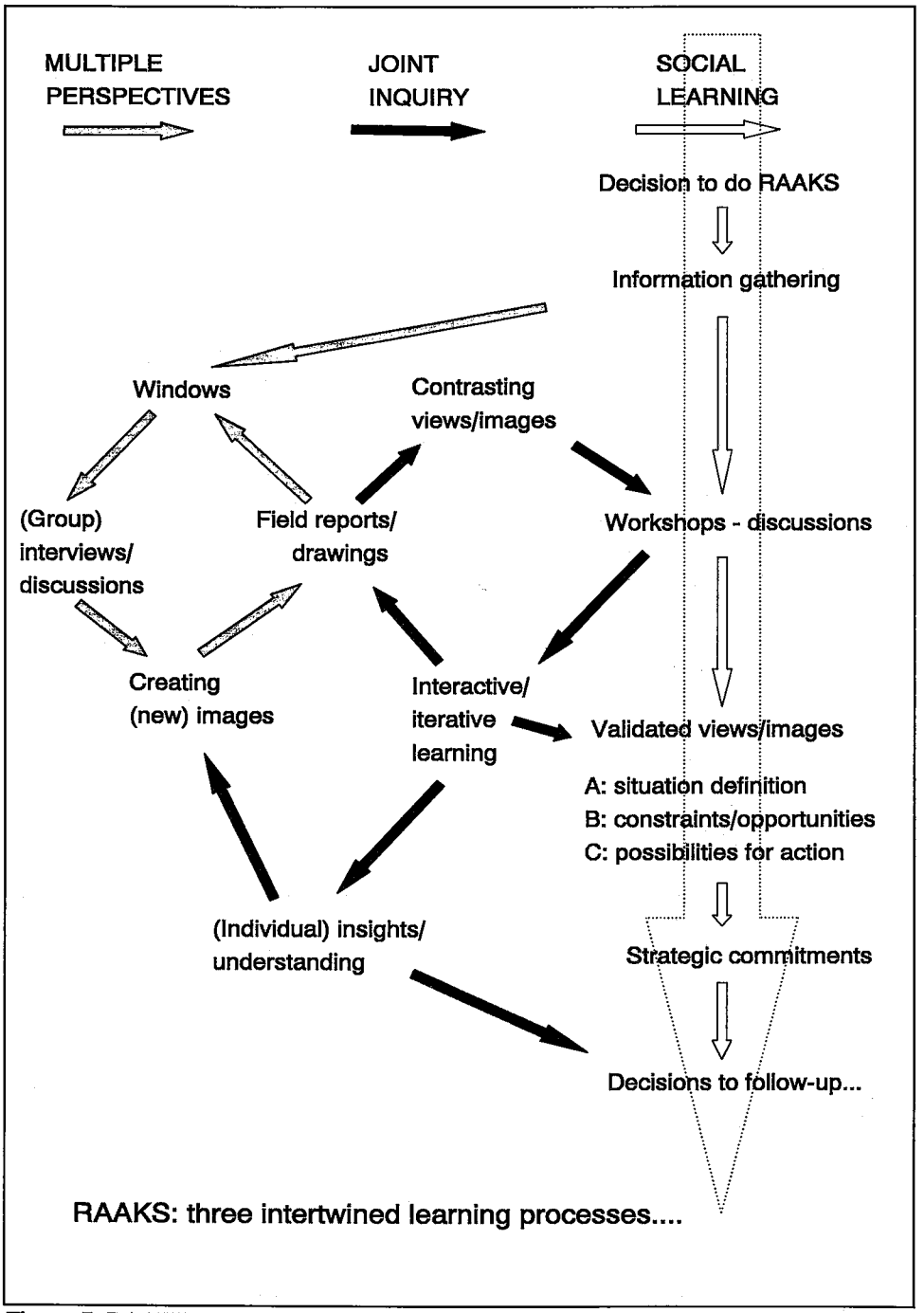

Figure 7: RAAKS as a learning process

experiences show that negotiating new or improved alliances for agricultural innovation can be part of RAAKS, even to the extent that social actors decide to go several steps further than stipulated by the design of exercise. In other cases, the commitment to form new alliances was less outspoken but the exercise brought stakeholders to formulate and discuss concrete suggestions for improving their interaction. Each of the studies did indeed lead to specific action proposals, each of which was rooted in its particular natural and socio-economic context. I conclude that RAAKS stimulates the exchange of views among social actors, otherwise not frequently engaged in such reflections, contributes to a shared, if not agreed upon, understanding of the situation, and thereby paves the way for negotiating comprehensive and/or partial solutions to the problems defined.

Fourthly, our results indicate that RAAKS indeed upholds diversity in actors, volitions and practices and pays considerable attention to (re)defining the problem as part of the exercise. It takes as a point of departure the different points of view on innovation which may co-exist among relevant social actors. The definition of 'relevant diversity' however remains critical. It requires a thoughtful effort both on the part of the research team and the social actors to recognize the (potential) contributions of others, some of whom are not normally appreciated as part of the innovation scene. In fact, it requires a critical reflection upon current institutional designs and reasoning about the social organization of innovation. While in the horse sector case, one may argue that such a redefinition was achieved with the help of the researchers' initial ignorance about the actual situation in the sector, leading to a definition of 'horse husbandry' which was unprecedented and new even to the actors in the theatre, in the Central American cases this was different. Here, a traditional definition was used to delineate the innovation theatre for basic grains in the project areas. Nevertheless, all studies recognized the potential importance of different categories of farmers, traders, agro-industries, non-governmental agencies and other actors which, from a traditional point of view, are generally not considered part of agricultural innovation theatres. This of course had much to do with the quality of the teams as well. Yet, even if not by its merits alone, RAAKS did facilitate a break-through traditional conceptual barriers with regard to the social organization of innovation.

From the above I conclude that the experimental use underscores the efficacy of RAAKS as a methodology. When we take 'to identify actors and define actions to improve the social organization of innovation' as representing a first step towards various project identification and formulation cycles, RAAKS has proved successful on account of all its three main objectives. It does help to increase awareness, understanding and networking among relevant social actors, it does create a space for exchanging views, propositions and interpretations to arrive at a meaningful definition of complex, ill-defined problem situations, it stimulates joint reflection and learning, and it does lead to specific proposals for action regarding the improvement of the social organization of innovation. In other words, it lays the foundation for social actors to raise the level of social aggregation at which they exert collective agency. It does *not* guarantee the eventual implementation of such proposals. This is entirely up to the social actors themselves. Furthermore, I have shown RAAKS to abide by the requirements I proposed for structured inquiry into the social organization of innovation. Therefore, I propose RAAKS has passed my first test and can be considered efficacious as a methodology. RAAKS can still be improved but it does what it claims to do.

On the use and applicability of RAAKS

A number of questions remain. In the first place: when, in what type of situation is it useful to apply RAAKS? Secondly, what different ways of application exist to suit various circumstances? And thirdly, who or what triggers the use of RAAKS and may follow it through in practice effectively? In this paragraph, I will review these questions and try to come up with some tentative answers from the case studies. In order to widen the scope of my argument, I will draw in some experiences by other authors who used (adapted forms of) RAAKS as well. This will enable me to illustrate how different ways of using RAAKS in practice may suit different contexts.

From the case studies treated in this chapter, it appears RAAKS is applicable in at least two different social contexts. The first originates from the wish of *one* particular social actor to (re)define his or her role. He or she faces a complex, almost 'existentialist' question: what is and what should be my contribution to the diffuse, social innovation process in which so many social actors besides myself are involved? The Reference Centre for the Dutch Horse Husbandry sector, affected by reorganizations and rapidly changing demands and circumstances, faced such a question. As a consequence, it needed better insight into the social organization of innovation within the horse husbandry theatre, to be able to reposition itself and its services. At one moment in time, any stakeholder in agricultural innovation could face the same question. We will refer to this context as *single-actor-induced*. The key characteristic of such a social context for RAAKS is that only one social actor declares a problem and others are asked to collaborate to review it. RAAKS may then help this actor (re)position him or herself within the existing innovation configurations and networks in accordance with his or her objectives and interests.

The second context results from unease on the part of *various* actors within one theatre who feel the present way innovation is organized does not live up to their (various) expectations. These social actors do not necessarily include all possibly relevant actors, nor do they all perceive the situation the same way. What they do understand however is that to a degree they depend upon each other to improve it. And they might feel there are others still which hold keys to innovative performance which they do not even know. The Regional Programme for Strengthening Agronomic Research on Grains in Central American provided such a context, as did the appreciations amongst NGDO leaders, staff and clienteles that triggered the development of intensive networking activities, described in chapter 6. We will refer to this context as *multi-actor-induced*. Characteristic to such a social context is that already several actors have declared their mutual interdependence in order to join hands to improve the social organization of innovation. In this case, RAAKS can help the actors prepare for raising their level of collective agency, by facilitating a joint problem appreciation, a diagnosis of constraints and opportunities for cooperation and communication, and designing action strategies to tackle some of the problems they have identified as affecting their innovative performance.

What both contexts have in common is that one or several stakeholders consider current innovative performance unsatisfactory while recognizing a considerable degree of mutual interdependence with others for improving it. Besides, they feel lack of understanding of the social organization of innovation among (certain) relevant stakeholders hampers the design and development of adequate solution strategies.

Various applications of RAAKS besides the Horse Husbandry study took place within a single-actor-induced context. Woltersbeek (1990) described the innovation theatre for shrubs and trees in town planning and development in the Netherlands, and reviewed the actual and potential role of extension. Ravensbergen (1991) compared the social organization of innovation in horticulture in two successful districts, one in the Netherlands and one in Israel. His study suggested strongly that no best way to organize innovation existed. Each theatre requires its own solutions. Meijer (1992) did a comparative analysis of the work of two different extension agencies attending peasant farmers in Chile, South America. Corten (1991) studied knowledge management in the Dutch forestry sector and pointed at the relevance of distinguishing between the philosophies and styles of forest exploitation among Dutch forest owners and managers in order to develop a differentiated research and extension offering. Noordermeer and van Zanten (1992) did a similar appraisal with respect to pisciculture. Experience indicates that RAAKS studies might also be successful in addressing similar questions in non-agricultural sectors. Boonekamp and Kleis (1992) used RAAKS to explore the constraints and opportunities for inter-institutional collaboration in developing services for elderly citizens in the Netherlands. In the Dutch transport sector, Den Bakker et al. (1993) used RAAKS' analytical approach to identify social actors, networking patterns and communication practices relevant to developing and introducing technologies for accomplishing quieter, cleaner and more energy-efficient trafic in urban areas.

All these studies have in common that they followed RAAKS' analytical design and intentionality. In each one the procedural design was modified. Validation of results was done with varying degrees of actor participation. In some cases this led to positive reactions from some other actors who felt they had benefitted from the study as well (Woltersbeek, 1990; Ravensbergen, 1991; Corten, 1991). In other cases, participation led to critical situations between the initiator of the study and other relevant actors (Boonekamp and Kleis, 1992). In yet other ones, the initiators appeared reluctant to share the collected information and insights with others intensively (Noordermeer and van Zanten, 1992; den Bakker et al., 1993). This points at the fact that in single-actor-induced studies, these actors exert a considerable degree of control upon the procedural design of the study unless an agreement to the contrary is arrived at beforehand, or the RAAKS procedure has been explained and agreed upon. And they do not always want to involve all other actors as actively in the process as is suggested by RAAKS. Sometimes this might be because they perceive too active a participation of other stakeholders as a threat to their interests, but mostly it seems to be because they consider the theatre not yet ready to develop higher level forms of collective agency. Most RAAKS exercises, also those where participation was active and wide-spread from the beginning, led teams and stakeholders to debate these and related issues of participation hotly. Eventually, in all studies a useful diagnosis and specific recommendations for action were generated. Naturally, one may expect the ones achieved with wide-spread participation of stakeholders to receive a stronger follow-up from within the community. Necessarily, the character of those studies in which participation of stakeholders was limited, remained more academic and less action-oriented.

The multi-actor-induced context is represented by the CORECA/CEE/IICA Regional Programme for Strengthening Agronomic Research on Grains in Central America. The programme had already established an organizational structure among some of the

relevant social actors before undertaking the study. Through this it assured the cooperation of a number of relevant actors in the exercise and it already set a number of parameters for directing its follow-up. In other words, some social actors had already inserted a new structural element into the social organization of innovation, i.e. the joint programme structure and its political and organizational design. This distinguishes such a context clearly from the first, where the participation of all actors in the process is one hundred percent voluntary, and no structure for implementing any of the recommendations is available beforehand. However, it is not hard to imagine that with a less formal structure, a multi-actor-induced setting may also arise. The NGDO networks I discussed in chapter six represent such situations. When NGDO leaders decide to initiate networking activities, no formal programme structure links them together until they decide to create one. Informal links between the organizations and, for example, with a common donor agency, may well precede such an initiative.

The Central American case studies have illustrated that RAAKS in such a context may contribute to increased understanding and to formulating precise proposals for action and/or intervention. However, its use in such a context creates expectations as well. Participating social actors, both researchers and social actors from the different areas of study, expect support from the programme to continue the activities they jointly decided upon during the RAAKS exercise. This creates claims upon the organization to facilitate and even finance such initiatives. We have observed two possible drawbacks which may occur. Firstly, due to lack of information or, alternatively, due to excessive enthusiasm the research teams and local actors may formulate initiatives which may not fall within the scope of the programme entirely, or, in the way they are presented may seem to deviate from its policies. Careful support from specialized consultants has to help rework such proposals to fit policy, planning and funding requirements. Secondly, the existence of such a structural element in the social organization of innovation can distract the attention of the research teams from the fact that most social learning for innovation is self-guiding and does not require management or intervention. A bias in favour of overemphasizing the role of formal institutions may occur. That such generally did not happen in the central American cases was due to the professional quality of the teams, their acute awareness of relevant policy and institutional developments in the region, their mutual support during meetings and workshops and to the guidance provided by the Regional Executive Directorate and its consultants.

Additional experiences with RAAKS in contexts similar to the second one have been obtained in health promotion. Adolfse (1992) explored the Health Food Knowledge and Information System in the city of Horsens, Denmark. And Naafs (1994) combined RAAKS and the WHO/RAP (Rapid Appraisal) methodology to identify opportunities for a community-based nutrition promotion programme in Luria, Spain. In both cases, the Healthy Cities "SUPER"-Project, a nutrition promotion project in six cities in Europe (Vaandrager and Koelen, 1994), created the context in which RAAKS could be implemented. Each of the research teams emphasized actor participation strongly while adapting particular aspects of RAAKS to their specific needs and circumstances.

It seems safe to conclude that in similar social contexts as the ones mentioned above, RAAKS is a practical approach to inquiring into the social organization of innovation. It works, it complements other participatory approaches and it produces the outcomes one

may expect form it. Its cost in terms of energy, time and finance is considerable, even if it implies only part-time involvement of the team members during a period of about six months. Therefore, I agree with the Central American teams that RAAKS should be used mostly in areas or sectors which deserve particular attention: because innovation is in particularly bad shape, for reasons of strategic importance, in programmes which need to make an impact upon the social organization of innovation within a limited period of time, and/or in projects specifically dedicated to improving innovative performance. An example of the latter, I might suggest, would be a project to stimulate the emergence of innovation-oriented multi-actor networks. Naturally, less comprehensive versions may be used within less demanding contexts.

The combination of RAAKS with other alternative systems of inquiry has been suggested several times and has to be explored further. This is also true for incorporating RAAKS in regular programme or project evaluation activities. It seems a viable option, yet no experience has been gained with it as far as I know. A last intriguing option which has emerged recently is that RAAKS can be used in a more problem-oriented way. In our examples, RAAKS was generally directed at a sector or an agricultural area, while more or less emphasis may be put on a particular target clientele. Recent experiences in the Netherlands (van Weeperen et al., 1994) and in Central America (Van Sluys, pers. comm.) suggest that RAAKS can also focused more directly upon certain burning issues, such as the development of new agricultural activities or the incorporation of environmentally sound technologies in (farming) practices. As a result of such a shift in focus, the domain of inquiry can be defined more precisely and emphasis may be shifted somewhat from problem clarification and (re)definition to creating adequate resource coalitions to follow through upon viable solution strategies.

A third social context in which RAAKS has been used is in extension and research training. In graduate and postgraduate courses at the Communication and Innovation Studies Department, Agricultural University of Wageningen, in the International Course on Rural Extension (ICRE), International Agricultural Centre (IAC), Wageningen, in the Netherlands, and in the International Course on Research in Agriculture (ICRA, french version), at the International Centre for Development Oriented Research in Agriculture (CIRAD), Montpellier, France. Even learning-by-doing RAAKS can produce remarkable results as the excursions of our M.Sc. students into the Dutch Ornamental Shrubs and Trees Sector demonstrate. Guided by the National Reference Centre for Plant Production, the students visited three different communities during three days and reported their results to a meeting of stakeholders afterwards. The discussions on the social organization of innovation in tree and shrub production were lively and to the point, to the satisfaction of the Dutch participants who at times became surprised at what a group of foreign students could learn about their practices in such a brief period of time. As a result, the next year a new group of students was asked by the farmers' organization to return in order to analyze the problems in the flow of marketing information between traders, retailers, marketing bodies and producers. Together with our experience in training national RAAKS teams in Central America, referred to earlier in this chapter (9.3), these experiences illustrate that a third context in which RAAKS has suggested its value is in educational inquiries into the social organization of innovation.

The types of professionals which could benefit from applying RAAKS to their work varies widely. All, of course, must be concerned with advising, managing or directing (agricultural) innovation, for example agricultural consultants, specialists from governmental and non-governmental agencies, researchers, extension or information managers. Therefore, training in the use of RAAKS needs particular attention. The professional quality of researcher-facilitators, the quality of their team work and the management of participation, communication and group dynamics require knowledge, skills and attitudes which have not been cultivated generally among agricultural researchers. As one component, the Central American teams suggested to create a regional network of consultants to generate, exchange experiences with RAAKS. Networking on RAAKS would seem a chance to create the conditions for learning-by-doing effectively. Obviously, this does not apply to RAAKS alone, other alternative methods of inquiry require a similar conditions to be able to develop further. This is the more important given the fact that RAAKS is and should remain 'unfinished business'. The Central American research teams very specifically pointed out that part of the success of the RAAKS exercises was due to its flexibility as a method. RAAKS does provide practical guidelines for inquiry (and these can be improved upon as we have seen) yet does not provide a methodological straightjacket. It provides the teams with a choice of windows and tools, yet it does not prescribe the 'logic of inquiry' in more than a general manner. Therefore it can (and must) be adapted to fit the local context, views and interpretations. And exactly because of that, RAAKS teams are to be composed of professionals who are very aware of and skilled in what they are doing.

On RAAKS' relevance to development practice

From a practitioners' point of view, a tool may resemble a hammer and even work like one, it becomes useful only when it can be integrated into a carpenter's practice. Therefore, after concluding that RAAKS has satisfied its design and practical requirements to a satisfactory degree, I want to briefly relate it to current methodological developments. How does RAAKS compare to the more general objectives and criteria which have been proposed for methodological approaches of its kind? This is no moment for a definitive evaluation. Still I will make a first attempt in order to tentatively characterize RAAKS' relevance to development practice. As a reference I will take the principles and criteria Pretty (1994) has formulated for 'alternative systems of inquiry'. This rapidly growing methodological tradition is gaining more strength everyday as development problems grow more complex and the levels of agency required to tackle adequately them increases. As RAAKS' roots lay in soft systems thinking and participatory action-research it seems plausible that RAAKS fits this emerging tradition. In this paragraph I will review whether this is really the case.

Despite enormous variety, alternative methods of inquiry in development have a number of fundamental principles in common (Pretty, 1994): (1) a defined methodology and systemic learning process, (2) the use of multiple perspectives - seeking to explore diversity rather than to characterize complexity in terms of average values -, (3) insistence upon group inquiry, (4) context specificity in methodological design, (5) facilitating experts and stakeholder participation, and (6) a focus on designing and implementing sustained action. A number of advantages of such approaches have been discussed in the literature. I will just collect a few examples here: they contribute to overcoming single-discipline limitations and to giving a voice to the subjects of our

inquiries (Foote Whyte, 1991); they provide an alternative to positivist research paradigms to address sustainability issues (Pretty, 1994); they provide us with a way of researching which combines finding out about complex and dynamic situations with taking action to improve them (Koelen and Vaandrager, 1994); and, by engaging stakeholders actively as co-researchers, they may help social actors move from joint problem appreciation to collective action (cf. Röling, 1994).

More relevant to our argument here is that such approaches also face at least two important methodological challenges. The first relates to what is generally referred to as 'scientific rigour' (Foote Whyte, 1991) in data collection, organization and information handling procedures. The second refers to their possible contribution to advancing social science. In this paragraph I will further concentrate upon the first, the second issue, as far as RAAKS is concerned, I will return to in chapter ten.

How we judge the scientific rigor of a methodology depends upon how we define it (Foote whyte, 1991; Pretty, 1994). If we define scientific rigour in terms of detaching the researchers from the context and the subjects of their inquiry, obviously none of the participatory approaches can meet its requirements. However, such a separation between the observer and the observed is virtually inconceivable in social science for development. To defend such a claim would also be at odds with the conceptualization of knowledge I have defended in chapter eight. Therefore, I choose to follow Pretty (1994) who proposes an entirely different set of criteria to establish trustworthiness of information. Koelen and Vaandrager (1994) transcend the boundaries of agricultural development and define a similar set of criteria for evaluating research performance in health promotion. For the limited purpose I aim at here, the criteria for defending trustworthiness of the information generated by means of alternative systems of inquiry can be grouped around three main issues. These I will use as standards to compare RAAKS against in order to make a preliminary judgment on its performance.

Scientific rigor may be defined in terms of creating conditions for mutual learning, cross-checking and validating information between researchers and stakeholders within the situation which has been defined as the object of inquiry. Participant checking "...forces researchers to go through a rigorous process of checking the facts with those with first hand knowledge before any reports are written" (Foote Whyte, 1991). Of course, the same applies to ideas, views and opinions expressed by different stakeholders and/or researchers. Participant checking can be complemented with persistent observations, peer checking and triangulation, comparing the results from different sources, methods and investigators. Different techniques are proposed to support such procedures (Pretty, 1994; Koelen and Vaandrager, 1994). The first key issue for achieving trustworthy information through alternative systems of inquiry is a *continuous cross-referencing of information, views, insights and relevant questions* with the help of multiple cases, investigators, sources and methods of information gathering.

A second element is rooted in the pursuit of diversity. By *seeking to express relevant difference*, in views, opinions, interpretations and presentation of data, alternative systems of inquiry create a strong joint awareness of, and reflection upon, bias among stakeholders and researchers alike. This process relies heavily on the continuous reworking of hypotheses, visualizations and detailed descriptive information. It triggers

mutual learning and re-orientation of inquiry, in turn leading to a more profound and pondered analysis and decision-making with respect to possible conclusions. Therefore, the second key to accomplishing trustworthiness in such an inquiry is *to generate effective networking practices* among people from often very different social practices. It requires active engagement between researchers and stakeholders, as well as among the stakeholders themselves. It leads to specific attention to establishing joint agendas and working procedures. The researchers, or experts, take on the role of facilitators in this process.

A third key issue is the impact on *the stakeholders' capacity to know and act* (Pretty, 1994), or, put differently, on local institution building to increase the capacity of people to participate and to initiate action on their own (Koelen and Vaandrager, 1994). To judge the trustworthiness of our results we may focus upon the results our efforts may have, eventually, when social actors take over the initiative from the researchers-facilitators.

Through its three intertwined learning processes, RAAKS obliges the researchers and stakeholders to recognize multiple views and analytical perspectives, to draw upon diverse sources of knowledge and information and to contrast these against each other in interactive and iterative learning cycles in order to arrive at conclusions. In practice also, this produces the continuous cross-referencing of views, ideas, insights and information we referred to earlier. Moreover, through various cycles and sub cycles of information gathering, organizing, discussion and decision-making, in which working hypotheses, graphic presentations and conclusions are created and revised continuously, RAAKS stimulates joint learning and reflection within the team of researchers, and, during the interviews and workshops, within the group of participating social actors as a whole. As we have shown, RAAKS stimulates active networking among researchers and relevant stakeholders leading to initiatives on the part of the participants often even beyond the original scope of the methodology. Clearly, our experimental applications of RAAKS confirm its consistency with the emerging action-research tradition we mentioned above.

However, our experiences also point at some of the intrinsic difficulties such methodologies face in practice. The trustworthiness of its results is heavily dependent upon what exactly is considered 'relevant diversity' in views, opinions, sources, methods and investigators by those performing the exercise. I learned that perhaps the most difficult bias to be made explicit and critically reflected upon, is the mental model, linear or otherwise, which guides people in their reflections upon knowledge and its role in development. Accepting too low a level of diversity may seriously hamper a teams performance. Yet at the same time it is very hard to conceive a standard for adequate diversity. To insist upon an intentional and persistent search for diversity within a specific context and a permanent debate among researchers and stakeholders as to its adequacy in view of the different purposes of the investigation, seem the best we can do at the moment.

Secondly, I learned that we must accept that the quality of the exercises depends heavily on the quality of the researchers, and the way in which they manage interactive learning processes, communication and group dynamics. These affect the trustworthiness of our results directly. And not many traditional researchers have been trained to perform such tasks well. My experience confirms that "systems of participatory inquiry (...) imply new

roles for development professionals, and these all require a new professionalism with new concepts, values, methods and behaviour" (Pretty, 1994). Particularly, what we need is a new communication professional whose skills have little to do with extension (Röling, 1994). In order to enhance the trustworthiness of our methods and approaches, we need professionals who combine an inquisitive and creative mind, an social problem-solving attitude with both research and facilitation skills.

Finally, I think our experience taught us we have not only to accept but to value contextual influence upon our research. Quite contrary to discarding such experiences as 'non-scientific', this leads us to address the socio-natural context explicitly as part of the problem. We can no longer pretend to isolate our research problems from it, nor can we pretend the 'freeze' the context while we are there. Contextual descriptions, analyses and debate should acquire greater prominence to review every perspective, point of view or other piece of information within its proper context. This has important consequences for the process of our research. 'Endless descriptions of irrelevant detail' in the eyes of some, may acquire a new relevance. At the same time, the well-probed and agreed upon acceptance of particular (long term or non-manipulable) contextual factors as 'facts' or trends to be reckoned with, may speed up the research process considerably.

9.5 Conclusions and other critical issues

It is difficult to draw definitive conclusions on a flexible, open-ended methodology such as RAAKS after an initial series of field tests. Still, I believe that on the basis of the information and discussions presented above I may answer my last two research questions. Yes, a practical methodology can be designed following the objectives and criteria laid down at the beginning of chapter eight. RAAKS has proved its efficacy and applicability in the field convincingly (Q4). RAAKS' potentials and limitations are less easy to point out. Definitely, RAAKS is more useful in some contexts as in others. Generalizing, one may say that RAAKS can contribute most to situations in which a relevant number of stakeholders is aware that: 'society' requires them to innovate their practices continuously and at an adequate pace; that they experience a 'lack of new ideas and new, viable options' and perceive it as a problem; that innovation requires exposing oneself to the ideas of other stakeholders rather than to withdraw from these; and that the current lack of progress is important enough to do something about it. However, RAAKS can be executed with varying degrees of participation and still provide interesting results. The level of participation implemented, however, could be closely related to the eventual impact a RAAKS exercise has upon actual innovative performance at the community level. It is clear, that in situations where social actors are not willing to sit on one table to discuss seriously their collective innovative performance, a participatory RAAKS exercise is not the first step one would think of.

But, how trustworthy are my evaluation results anyway? I have argued RAAKS includes the necessary elements to be trustworthy as an approach to applied scientific inquiry, but how biased are my own evaluations of the use of RAAKS? In the near future, others will have to, and certainly will take part in this discussion, but for starters I want to offer three arguments in favour of concluding that my methodological evaluation is trustworthy and one doubt against it. This will provide me also with an opportunity to express what I

feel were some of the biases that influenced my research. It leads me to conclude that on the basis of my methodological evaluation of RAAKS a set of solid propositions can indeed be suggested.

On the trustworthiness of the methodological evaluation of RAAKS

The first argument which I feel is strongly in favour of accepting my methodological evaluation, is that in all studies I took as a basis for it, my own involvement was limited to providing the research teams with initial training and some support in the final drafting of their reports. In between their exposure to me was minimal. Only in the horse husbandry case, the first one we ever did, I took part actively in both workshops. The support that was given by consultants and the Executive Directorate to the national teams, equally was not affected by my own continuous presence and was given, again, on the basis of initial training and discussions between us. The data I have used for my methodological evaluation of RAAKS, therefore, are the written statements and pondered judgments of the research teams, cross-referenced between individuals and between teams, in some cases complemented with observations by consultants or my own notes from the training and evaluation sessions. By letting the RAAKS applications happen like this, I believe I have created a 'distance' between myself, and other persona involved in the RAAKS' design, which enhances my claims of trustworthiness.

The second argument I may bring forward is the professional quality of the research teams which executed the experimental applications. All participants were well-trained researchers or research managers, extension managers, trainers or field workers. None of them had an 'a priori' interest in promoting RAAKS. All went through considerable difficulties, had to dedicate considerable amounts of precious time and energy to the experimental use of RAAKS. I consider they would not have done that if they had not felt that participating in a RAAKS exercise contributed significantly to their minds and work. Their enthusiasm and positive criticisms, I would argue, are genuine indicators of RAAKS' relevance and efficacy as a methodology. It does not say very much, I fear, about RAAKS' efficiency in reaching its objectives. In this respect, the quality of the teams may have obscured certain flaws in its practical design.

The third argument is that, if ever a comprehensive methodology can be tested in a 'laboratory situation', the Basic Grain Programme in Central America provided the right context to do it. The initiative and coordination of the Regional Executive Directorate as well as the supporting consultants, guaranteed uniform and supportive conditions for the teams to work in. This synchronized the teams' efforts. Eventually, they were able to implement RAAKS according to its design and the instructions provided. And draft reports of every single application were presented in time to be discussed at the final regional workshop. Finally, the permanence of the team members in the teams, to which members were added but which hardly ever lost one, provided the continuity and seriousness one would expect to contribute to a pondered reflection upon the exercise as a whole.

The one thing I can think of which could have flawed the methodological evaluation I have just presented is the same enthusiasm I referred to above. The initial training in knowledge system thinking and RAAKS so literally seemed to feed into the questions most of the team members had already been asking themselves with respect to their

professional environment, that perhaps this enthusiasm was overdone and would have dissipated to some degree when more time could have passed between the initial training, the RAAKS exercise and the final evaluation of its results. Perhaps some of the initial optimism would then have worn off and be replaced with justifiable scepticism as to the practical use of the methodology. My own appreciation of this issue is that most of the professionals from the national teams did in fact reach this stage within the period it took to execute and evaluate the exercise, due to their earlier experiences with 'rapid' and 'systemic' methodologies. Therefore I consider the optimism they expressed with respect to RAAKS not as rash statements but as a well-probed and well-weighed opinions.

Some propositions

RAAKS has passed its initial tests. Only its further integration in development practice leading to a more extended use may answer the question whether it indeed represents a new and useful tool in the hands of those professionally engaged in the management of knowledge and information for innovation in agriculture. RAAKS can be further developed to suit different contexts. Already indications exist that RAAKS could contribute significantly to platform processes helping social actors to raise their ability to act collectively to levels which are adequate for addressing the complex social and ecological issues they are faced with today. RAAKS' potential to contribute to improving and, if necessary, reorganizing innovative practices in agriculture or other sectors has been confirmed. Finally, RAAKS may inspire colleagues to develop methodologies along similar lines but focused on other domains of inquiry, different from the social organization of innovation.

The use of *actor arrangements* for visualizing complex social wholes, however important from the point of view of addressing strategizing and social interaction for development, should be complemented with the use of *activity arrangements* as well. This line of soft systems analysis has to be further explored to yield a more comprehensive set of instruments of inquiry than has been the case until now. Whether *input/output arrangements* may eventually be developed to suit soft systems analysis remains to be seen.

The design and development of 'alternative systems of inquiry' proves a demanding academic task. Systematic research is needed to do it successfully. It seems unsatisfactory to just let it happen in the margin of development programmes. For the next century, our approaches to dealing with complex issues might well prove more relevant to our survival as a species than any of the specific socio-natural relationships we are able to 'unravel'. Apart from adequate funding for applied methodological research, international networking between professionals from relevant international institutes and university programmes is urgently needed.

10. Summary of conclusions

10.1 Introduction

In this last chapter I intend to review briefly what I have done and the results obtained. To those familiar with the preceding nine chapters, this one provides an opportunity to review and indeed judge the coherence of my thoughts and arguments. Also, I will discuss issues relevant to those professionally engaged in studying and/or facilitating complex innovation processes, and point at issues I consider are left pending. These readers are probably best served by scanning through 10.2 and 10.3 quickly and engaging fully as from paragraph 10.4. To those who were too impatient or had too little time to go through the rest of the book before reading the last chapter, this chapter will provide an overview. I would be disappointed if it would fail to motivate them to read the other chapters as well.

10.2 Research questions, expected results and methodology

Q1. How do different actors or parties organize themselves in order to achieve agricultural innovation?
Q2. What do they actually do, in order to achieve the transformations they aim at?
Q3. What criteria should an action-oriented methodology meet in order to be able to contribute to facilitating innovation in agriculture?
Q4. Can a practical methodology be designed along the lines specified above?
Q5. What are its potentials and limitations in practice?

Box 1: five research questions to guide this inquiry (from chapter one)

The starting-point for this study was my experience in agricultural development projects, first as an extension communication specialist and later as a manager. The more I tried to actually stimulate (technological) innovation, the more dissatisfied I became with the practical value of known innovation theories. I felt the need for a more generic, more action-oriented approach which would help us understand innovation as a complex, social process. Given the growing complexities agricultural innovation strategies are faced with, I thought we had to go back to what people actually do and how they organize themselves to innovate their practices, and build an empirically validated perspective from there. This made me focus on the *social organization of innovation* in complex agricultural theatres. This book is the result of my struggle to make sense of what I was able to observe. Box 1 summarizes the research questions which guided my inquiry.

The questions also mirror my feeling that understanding complex, social processes of innovation is not enough. An inquiry should lead to improving our interventions as well. As a result, besides an *exploratory path* which I hoped would help me gain empirical insight into the social organization of innovation and would yield new relevant perspectives to study complex innovation processes, I set out on a track which I hoped would lead me to formulating a practical methodology to help social actors to improve innovative performance. This I labelled the *design path*. The exploratory path focuses mostly on research questions Q1 and Q2, while the design path addresses questions Q3, Q4 and Q5. The results I expected my efforts to yield are summarized in box 2.

R1. A significant contribution towards designing a coherent and empirically validated *conceptual framework* to facilitate a critical analysis of the social organization of innovation in agriculture and its management: towards *appreciative systems thinking*.

R2. A set of valid and applicable *windows* or analytical perspectives to enable researchers and practitioners to gather and process relevant information for qualitative research into the social organization of innovation in agriculture.

R3. A field-tested *methodology* to guide a process of participatory inquiry into the social organization of innovation in agriculture leading to the identification of relevant actors and useful interventions to improve it: *RAAKS, a participatory action-research methodology to improve innovative social practice in agriculture.*

Box 2: Intended results of this study (from chapter one)

The methodological approach I chose is essentially qualitative, but even more than that: reflexive. My own experiences as a development professional are both a starting-point and a permanent reference. Moreover, I was not so much interested in proving or disproving already known propositions as I was in generating new ones. Therefore, to anchor my studies I used case studies. Over a period of nine years, I did four case studies, two synthesis studies, reviewing a total of over 25 cases, and tried out the methodological design in 15 different areas. In all, the cases covered 15 different countries, including the Netherlands.

The choice of the knowledge systems perspective (Röling, 1988, 1994) to try to organize my thoughts was at first mostly intuitive: it provided me with a heuristic instrument to study the social organization of innovation which seemed richer than any of the other conceptualizations I was aware of. But it is meant to be a perspective, not a theory. It focuses our attention on a domain of inquiry, but does not offer a particular way of explaining what we observe. This I considered a heuristic strength, enabling social actors to attribute meaning for themselves, but a weakness from the point of view of developing a more empirical understanding of the social organization of innovation. Together with soft systems thinking (Checkland, 1989; Checkland and Scholes, 1990), however, it made a forceful combination to initiate my inquiries.

10.3 Conclusions from the case studies

The Dutch cases discussed in chapter three underscore the relevance of communication networks among farmers, book keepers, sales people, veterinary doctors, advisers, researchers, extensionists and many others for successful innovative performance. They put in evidence the limitations of the concept of 'knowledge transfer' in which one actor is the 'source' and another the 'user'. Rather, the case studies show that each of the stakeholders in agricultural innovation is both 'user' and 'source' of relevant knowledge and information at the same time. Each social actor adds specific value to a gradual, task-oriented *integration* of different strands of knowledge through an active participation in a diversity of interactive communication networks. This participation provides social actors with a wide range of ideas and technological options from which to choose. Also, the case studies showed the strategizing and professionalization which occurs with respect to communication for innovation.

The Nariño, Colombia, case underscores that the existence of joint learning opportunities among relevant social actors and the integration of knowledge and information from a variety of relevant sources are to be considered important elements in explaining successful innovation. However, the Nariño case also points at the importance of mutual adjustments among relevant institutions and other social actors. A direct link between inter-institutional coordination and practical impact is suggested. Moreover, it pointed at the importance of institutional leadership, strategic consensus and effective resource linkages, within a socio-economic and political context which is conducive to agricultural change. The case study puts in evidence that the capacity to innovate agricultural practices should be seen a collective, social competence, rather than as an individual one of any of the social actors involved.

The first synthesis study explores the emergence of institutional leadership and the coordination of tasks among institutional actors in complex agricultural innovation theatres. It shows how alliances are forged which take it upon themselves to promote a particular type of innovation process, targeting a particular category of farmers. Within such alliances leadership patterns and coordinating mechanisms evolve which may successfully govern collective actions and decision-making. These emergent structural arrangements we have labelled institutional configurations. On the one hand, such configurations are renegotiable and naturally in flux. On the other, over time they may become increasingly rigid and inflexible which may hamper their ability to adapt quickly to changing circumstances. Also, institutional configurations are affected by design. But it is a 'design' achieved through a diffuse, social process of accommodation between a variety of stakeholders, rather than a rationally planned organizational design. In order to facilitate complex innovation processes, understanding the role of design and the emergence of effective institutional alliances seems essential. Configurational analysis, making several amendments to Mintzberg's (1983) approach, is proposed as an instrument.

In the second synthesis study, I look at alliances which have been established for the explicit purpose of improving the social organization of innovation: NGO networks for enhancing sustainable agriculture. The study shows their 'networking' to concentrate on four main functions: (1) creating opportunities for learning-through-joint-reflection, (2)

mutual support, (3) sometimes, joint advocacy, and (4) network management, organizing their interaction in such a way that they are able to achieve their objectives in the most effective and efficient way possible. Just as configurations, networks required strategic consensus, an agreed upon definition of tasks and responsibilities and coordinating mechanisms. However, in several ways networks among non-governmental development organizations seem to differ from institutional configurations. The main differences are found in the formative process that leads to the establishment of a network, in their explicit recognition of mutual interdependence and the need to 'learn from each other' and in the emphasis networks place on participation and decentralized decision-making.

10.4 Winding up the exploratory path: towards a theory of social organization for innovation

My research permitted me to formulate a number of propositions with respect to the questions that guided my 'exploratory path' (Q1, Q2, box 1). These merit further empirical research but, as I have shown in chapter seven, seem well-founded in my own case and synthesis studies as well as in current professional and academic thought. Together they lay down the contours of a conceptual approach towards understanding the social organization of innovation: *agricultural innovation* can be looked at as resulting from the interplay between social actors from relevant social practices. It is a diffuse, social process of both individual and collective inquiry into volitions, propositions and contexts which leads to new or modified problem definitions and practical choices of solutions. *Volitions* are the 'projects' actors express, in language or action, to make sense of their contribution to innovation and social change in agriculture. *Propositions* refer to the (social) organizational and scientific/technical solution strategies which are identified as relevant to certain volitions. *Contexts* refer to the socially constructed as well as the natural conditions which reduce the degrees of freedom for actors to create/choose between volitions and propositions. The organization and quality of the interplay determines the course of innovation. The *social organization of innovation* may then be characterized as the way in which social actors organize themselves for and perform the interplay.

What social actors actually do in order to innovate their practices (Q2) may then be qualified as *networking in-and-between relevant social practices*. Social practices are discernible sets of social actors who define and uphold competent performance through (some form of) social interaction. Relevant practices may include farming, research, extension, education, input distribution, agro-industries, commercialization, mass media communication, policy-making, seed certification, etc. In order to gain access to a wide range of options and insights, social actors actively engage in building and managing interactive relationships with social actors from their own and/or other practices whom by some standard they consider relevant to their concerns. Networking for innovation comprises (1) the creation of joint learning opportunities amongst social actors of relevant social practices, (2) the interactive probing of relevant volitions, propositions and contexts and (3) the pooling of energies and, often but not necessarily, other resources. Communication plays an important role. Also, networking is tied closely into the daily work of relevant social actors. It is an integral part of the activities of the 'knowing'

individual. The *appreciative character* of networking stems from the need to make choices continuously. While networking, participants are required over and over again to make decisions on whether to include in the networking effort a particular actor, practice, volition, proposition or context. A decision to include takes energy, time and/or money and can only be justified when the element in question is perceived as relevant to the inquiry. As a consequence such decisions are arbitrary ones, taken within the context of the current relationships between stakeholders in a particular innovation process. My findings suggest a direct relationship can be postulated between the *quality of the networking* between relevant social actors and the outcomes of a particular innovation process.

In answer to research question Q1, I propose that the way social actors organize themselves to take part in, and possibly direct, the innovative interplay can be characterized describing the structural forms which emerge as a result of sustained networking and studying the relationships that exist between them. According to my studies, the following merit particular attention from students of the social organization of innovation: (1) convergences, (2) resource coalitions, (3) communication networks, and (4) innovation configurations. Each of these represent macro-structures which come into existence as the result of largely unintended consequences of social action. As *emergent forms* they are not fully describable or explicable in terms of micro-events. They reflect dynamics of their own. Their outcomes often seem not to have been decided upon but simply to have happen. *Convergences* emerge when social actors narrow down the scope of their arguments and the range of issues and alternative scenarios they consider relevant to innovating their practices. *Resource coalitions* emerge when social actors decide to pool their resources in a joint performance. They are the result of strategizing by social actors who use their assets to enrol others in their 'projects'. *Communication networks* emerge as a direct consequence of social actors' decisions to create joint learning opportunities and to produce and exchange information among themselves.

Over time, networking may lead to the gradual development of a pattern of more or less durable relationships between a number of social actors who perceive each other as relevant to (some of) their concerns. Such *innovation configurations* harbour the accepted views, procedures and ground rules for collective behaviour with respect to (a particular type of) innovation. In such configurations, convergences, resource coalitions and communication networks come to coincide enough to make strategic consensus, a clear definition of tasks and responsibilities and a rational allocation of resources possible. While in most cases it seems hard to think of 'orchestrating' innovation processes, a configuration provides a context in which thinking of at least coordinating innovative efforts is not outrageous. Still, such emergent alliances are in flux continuously, they may take unexpected or even largely unintended turns, yet at their roots lies a common concern shared between a number of relevant social actors. Only if social actors remain willing and able to negotiate and effectuate mutual adjustments, their configuration may eventually become and remain well-organized and stable. Adequate institutional leadership, an agreed upon division of tasks and effective coordinating mechanisms are then in place.

Being well-organized and stable, however, does not automatically mean being able to adjust to changing circumstances, new challenges and/or threats easily. In our studies we have looked particularly at *institutional configurations*, alliances for innovation as they emerge between government or semi-government institutions, industrial companies and/or farmers organizations. It becomes apparent that, depending upon the type of leadership and the way coordination is achieved, many different types of institutional configurations may evolve. And not all seem equally well adjusted to meet the innovative demands of modern development. Therefore, we have proposed configurational analysis as an instrument to study the effects of leadership and coordination upon innovative performance.

The patterns of actors and relationships which evolve as a result of networking by individuals (farmers or professionals) or non-governmental organizations appear to be of a different character than those emerging among government institutions. My analysis of networking among non-governmental development organizations revealed that, as in other configurations, convergences, resource coalitions and communication networks may coincide sufficiently to provide a network with purpose and organizational strength. But it is the formative process that leads to its existence which is completely different. Our study suggests that networks among non-governmental agricultural development organizations are created intentionally as a space for joint learning and reflection. Mutual interdependence is a given, recognized by all involved. Besides, not only technical solutions but also intervention objectives are subject to debate. Active participation of all member organizations is not just a formal requirement, it is a working standard. The formative process is taken as an opportunity to build a strong foundation for future cooperation, not just as an opportunity for renegotiating the institutional balance of power. And finally, networks not only recognize mutual interdependence, they nurture it by means of programmes for mutual support, services and, sometimes, by taking part in the public debate jointly. Therefore, preliminary evidence suggests that *innovation networks* may prove to be the more flexible forms of social organization for innovation modern agricultural development needs. However, this can only be true if networks succeed in maintaining themselves as 'learning organizations', dedicated to high quality networking for innovation.

For government institutions to be able to participate in such networks actively, a number of requirements would have to be fulfilled. Firstly, networking requires a number of social actors not only to be 'like-minded', but also to have a fair degree of autonomy to adjust their views and strategies when need arises. Hierarchical power structures such as exist in most government bureaucracies seem to be at odds with networking for innovation. Central authorities would have to 'draw back' from controlling day-to-day operations in order to facilitate effective networking among government and other agencies. Besides, whether government authorities would ever be willing to cede to decentralized government institutions the time and space to 'test the waters of cooperation' effectively, is another question. 'Planned activism' as a first fundamental step in networking, seems incompatible with current efficiency-oriented bureaucratic discourse.

An important issue to consider when discussing the adequacy of different types of configurations for innovation is that, historically, social forms emerge as a result the

intended and unintended consequence of series of social interactions, often over periods of many years. More than the convergences, resource coalitions and communication networks, institutional configurations and innovation networks are affected by collective design and strategizing by stakeholders. Hence, in their structure and operations they mirror the innovation theory their constituent actors had in mind and the subsequent historical developments that affected them. As a result, while all social forms relevant to innovation may possibly demonstrate a certain inertia when faced with changing circumstances, one may postulate that in the case of institutional configurations and long-established networks this is even more the case.

Concluding this paragraph, one may ask how, if at all, the conceptual approach proposed above may strengthen the Knowledge and Information Systems perspective. In my view it does in two respects. Firstly, it offers a number of new 'windows' to analyze our domain of studies. It focuses our attention on networking as social practice, convergences, resource coalitions, communication networks and innovation configurations. Also, it suggests volitions, propositions and contexts as fundamental ingredients of the probing, social interaction and decision-making among stakeholders that characterizes complex innovation theatres. Secondly, it offers a more comprehensive approach to reasoning about the social organization of innovation. It addresses innovation as a social process, not as a technological one and puts knowing human actors at the centre; it recognizes appreciation and social interplay as cornerstones of innovation; and it enables us to reason more integrally about key issues such as innovative performance, communication, integration, coordination, intentionality and choice, which hitherto could only be addressed separately. I propose the study has yielded some preliminary elements of what once may become an action-oriented theory of social organization for innovation. As a result, the conceptual framework may contribute to integrate as well as deepen appreciative knowledge systems thinking.

10.5 Bringing the design path to a close: RAAKS, an action-oriented methodology

RAAKS[1]is designed as a soft systems methodology to enable stakeholders to engage in meaningful discourse about the social organization of innovation and to design measures to improve it. The images RAAKS helps create emphasize social interaction between social actors from different relevant practices and help stimulate debate and reflection. Active participation of stakeholders is foreseen and also a thorough reappraisal of the problem definition. In addition, RAAKS with its threefold objective - to raise awareness and understanding, to probe new alliances and to formulate action proposals - is facilitative and action-oriented and has the potential to generate tangible results. Moreover, RAAKS contributes to an accumulative, social learning process among stakeholders leading from problem appraisal (phase A) to action definition (phase C) and also stimulates a joint inquiry into relevant practices, networking and emergent structural forms of social organization for innovation (phases A and B). It does so by offering a variety of windows, or views from different analytical perspectives. The integration of

[1] RAAKS stands for 'Rapid or Relaxed Appraisal of Agricultural Knowledge Systems'.

these windows is obtained by the use of a conceptual framework rooted in appreciative knowledge systems thinking.

RAAKS is based upon the findings of our research in three ways. First, it adheres to the design criteria we formulated as an answer to research question Q3. We concluded that a methodology to support social actors in improving the way they organize innovation may fruitfully apply a knowledge systems perspective but would have to include additional theoretical perspectives as well. Moreover, it would have to be based upon appreciative systems thinking, offering stakeholders the possibility to engage in meaningful discourse on the social organization of innovation themselves. Lastly, it would have to include a thorough reappraisal of the problem situation, stimulate active participation by stakeholders and produce tangible results. RAAKS' close fit to these criteria is discussed in paragraph 9.4.

Secondly, RAAKS sets the stage for innovative interplay to improve innovative performance. Its procedure is based upon the lessons we have learned about innovative interplay between social actors, how it is organized in practice and how it can be improved. A RAAKS exercise, as it were, 'mimics' successful innovative practices but now with a focus on these practices themselves. Volitions, propositions and contexts are made explicit, social interactions between stakeholders are intensified and action-orientation and integration with daily activities is safeguarded. Thirdly, RAAKS uses the windows which our research proved relevant, useful and applicable (see box 7). The role of the windows merits some more detailed attention. They help focus on particular issues quickly, so that participants are able to construct a variety of pertinent images mirroring their appreciations of relevant events and ideas. Contrasting these views during workshops and meetings generates a 'juggling with perspectives' that contributes as much to the practice as it does to the sensation of interplay among participants.

Due to its flexible design, RAAKS may be used in different ways. Its original concept corresponds to a participatory action-research methodology. The ones to implement such an exercise would be a team consisting of some subject-matter specialists and some specialists acquainted with RAAKS. Stakeholders participate actively as co-researchers. However, RAAKS' analytical design proved useful as well in the hands of those doing less participatory field research. The windows and tools provide the researcher with a coherent set of perspectives and operational tools to study and reflect upon the social organization of innovation. In addition, RAAKS has been used to guide an 'excursion-type' inquiry as a training session concerned with the way innovation is socially organized. Lastly, policy makers and managers at different levels may use RAAKS as an instrument to gain more insight into impairing or enabling conditions or perhaps even to gauge innovative performance regularly. Finally, we may add, RAAKS has proved useful in many situations outside agriculture. Experimental applications in health promotion, environmental programmes, solar energy introduction and for diagnosing the social organization of innovation in traffic and transportation, have convinced us that it may contribute to facilitating innovation outside agriculture as well. Much research is still to be done to actually fulfil this promise.

In its original participatory action-research form, RAAKS seems most useful in some social contexts than in others. We may suggest at least three different social contexts in

RAAKS' windows:

Problem definition and system identification:

A1: Redefining the objective of the appraisal: who's problem is it anyway? What is it about?
A2: Identifying relevant social actors: who is involved, or should be? What is it about in their eyes?
A3: Tracing diversity in mission statements: who pursues what, why? Who perceives what 'problem'?
A4: Environmental diagnosis: natural, economical and socio-cultural factors to be taken into account.
A5: A first approximation: clarifying the problem situation; who is relevant, why, how?

Constraint and opportunity analysis:

B1: Impact analysis: volitions cause assessments to differ; what is the outcome in practice?
B2: Actor analysis: not all actors are equally relevant for, or interested in each type of innovation!
B3: Knowledge network analysis: studying interactive communication for innovation.
B4: Integration analysis: studying linkages and resource coalitions.
B5: Task analysis: what should be done to innovate and who does it?
B6: Coordination analysis: studying leadership and orchestration.
B7: Communication analysis: cultural barriers in the way of effective communication for innovation.
B8: Understanding the social organization of innovation: how does it work? Or, does it?

Policy articulation/intervention planning:

C1: Knowledge management: What can be done to enhance innovative performance?
C2: Actor potential analysis: Who can, and is willing to do what?
C3: Strategic commitments; Who will do what? Who will participate in carrying out the activities?

Box 7: RAAKS' windows: appreciating a situation and the social organization of innovation from different angles.

which RAAKS may yield good results. First, RAAKS proved useful in extension and research training. As a combined exercise of practice and theory it helps (future) extension and research managers study and increase their understanding of the social organization of innovation. As a result, they get a better idea of the context in which they operate their services. They learn to how to diagnose and assess the strength and qualities of existing networks, and how to prepare interventions to improve innovative performance. This enables them to reflect more systematically upon the role of their

institution as part of a wider agricultural knowledge and information system or its possible contribution to new forms of collective agency to tackle complex social issues.

Secondly, RAAKS can be useful to all those, individuals and organizations, who provide or sell a 'knowledge/information-intensive' products or services, requiring permanent R&D, updating and training of staff and a permanent search for new niches in the market. I feel it was not by accident that RAAKS was developed originally within the context of agricultural advisory services during a period in which industrial agriculture reached its ecological, social and political limits and these services suffered important changes like privatization, re-orientation on sustainable agriculture, and commercialization of knowledge and information flows. RAAKS first applications were to support the reorganization of agricultural research and extension. Still, this is the area in which it has made its strongest contribution. And, despite promising experiences with the use of RAAKS in support of commercially operating consultants, to develop RAAKS for such target groups would imply a major development still.

Thirdly, RAAKS may be useful to stimulate the formation of what Röling (1994) has called 'soft platforms for decision-making about ecosystems'. As RAAKS facilitates structured inquiry into, developing a shared understanding of complex social innovation processes, it may help social actors to define how to organize themselves for tackling such complex issues as the management of a natural resource (i.e. a natural park or ground water or a catchment area), regional development, waste prevention, or stopping environmental degradation in sensitive areas. To deal with each of these problems requires the involvement of a variety of social actors, some of which have never before perceived the others as relevant to their concerns. In such a case, relevant networks exists but articulation of all relevant stakeholders is inadequate. A RAAKS exercise may then help diagnose what is already in place, what its impact is with respect to the issues involved, and hence lay the foundation for the design and implementation of more adequate articulations. This makes RAAKS into a promising instrument to create the conditions for, and initiate so-called 'platform-processes' leading to forms of collective agency to tackle complex societal issues.

Generalizing, one may say that RAAKS can contribute most to situations in which a relevant number of stakeholders is aware that: 'society' requires them to innovate their practices continuously and at an adequate pace; that they experience 'lack of new ideas and new, viable options' as a problem; that innovation requires exposing oneself to the ideas of other stakeholders rather than to withdraw from these; and that the current lack of progress is important enough for them to do something about it. As innovation emerges out of social interaction, in such cases RAAKS may help stakeholders assess the quality of current social interaction for innovation, or the lack of it, and design ways to improve it. Equally, this means that, where social actors are not sufficiently aware of the above, the use of RAAKS in its original, participatory form is not to be recommended.

A number of interesting issues remain pending with respect to the RAAKS design, development and implementation. Let me conclude this paragraph by mentioning three: (1) What is an adequate time frame to plan and execute a RAAKS exercise; and how does this relate to the complexity of the issues at hand and the number and commitment of stakeholders? Our exercises ranged from 6 weeks for a two person full-time team, to 6

months for larger teams who were involved part-time only. It is clear that the quality of the teams and the support they obtain from their own institutions and stakeholders is of fundamental importance. More study will be necessary to find answers to these and similar instrumental questions.

(2) How does RAAKS relate to other participatory research approaches? In paragraph 9.4 we have argued its pertinence to an emerging tradition of 'alternative systems of inquiry'. A recent study (Hoeberichts, 1994), demonstrates the complementarity between Participatory Rural Appraisal and RAAKS. Both seem compatible in terms of principles and procedures, and complementary with respect to their domains of inquiry. As a result both shed a different light on the socio-natural processes they help study. The further development of this tradition, including research on similarities and differences in the practical use of the different methodologies is required.

(3) How can the study of relevant (technical) practices be strengthened in RAAKS? Our experiences point out that a detailed study of farming, research and extension practices, to name just a few relevant ones, may be an asset to RAAKS inquiries sometimes. Can this be done by including the creation of 'human activity systems' as a modelling technique? Can RAAKS be developed to include experimentation, role plays or interactive multi-media environments, so that it becomes less discursive and more practice-oriented? And when, under which circumstances, would this be advisable? It is clear that the further development of RAAKS and RAAKS-related methodologies promises to remain a rich experience.

10.6 Issues for further research

Knowledge management: between serendipity and structure

This research has implications for our understanding of knowledge management. I have introduced the term 'knowledge management' for those activities directed at supporting social learning for innovation, articulating individual efforts to achieve a joint performance. It corresponds to a vision of management as "...the initiation, direction and control of purposeful activities" (Heck, van, 1993: 64). My study of complex innovation theatres and inter-organizational relationships has concentrated upon the first steps only. My efforts focused on finding ways to build an understanding of the social organization of innovation in order *to enable social actors to define purposeful interventions*. To understand and to design useful interventions took preference over the direction and control of such interventions. RAAKS has become a methodology to jointly build an understanding of a complex problem situation, to debate and define useful interventions among stakeholders and to decide on whether and how to initiate them. Hence, it *facilitates* the design of improvements of innovative performance, providing a basis for managing it more effectively afterwards. Therefore, though I consider RAAKS an important instrument in the hands of people responsible for improving innovative performance, it is definitely not the last word on knowledge management. It is only a beginning.

My research does underscore the relevance of an amplified approach to knowledge management in complex multi-actor situations. An approach that focuses only on

education, training and/or information logistics is not enough. To facilitate knowing between organizations, inter-organizational communication, direct and indirect, joint learning and sense making, and resource pooling would have to become an objects of study and eventually of (knowledge) management. The adequacy, effectiveness and efficiency of current networking practices would have to be scrutinized and improvements designed. Further studies could include research on what happens when RAAKS is finished, whether and how existing resource coalitions, convergences and communication networks are affected by the communication and cooperation strategies initiated as a result of RAAKS. This could contribute to understanding much more clearly what can be managed and what not. As I see it, the challenge for management sciences with respect to social organization of innovation is 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. If anything has become apparent in my inquiries it is that the 'McDonaldization' (Ritzer, 1993) of complex innovation processes between organizations has little future.

RAAKS as a research methodology

What could be the relevance of RAAKS for scientific practice? Can RAAKS itself, apart from contributing to improved innovative performance in practice, contribute to a further accumulation of relevant scientific knowledge about the social organization of innovation? Can more specific hypotheses be addressed and evaluated through RAAKS? I definitely think so. In this paragraph I want to discuss my arguments. These are basically three: RAAKS' foundation in academic thought; its procedural design; and its flexibility.

In chapters eight and nine I have shown that the way RAAKS is rooted in academic thought is sound as well as consistent with the purpose of structured inquiry. Moreover, each of the windows of RAAKS has been validated as a relevant and useful perspective to study issues of social organization in complex innovation theatres, its domain of inquiry. This does not mean no other windows are thinkable. On the contrary, I indicated a few possibilities. It does mean however that RAAKS' design provides the (would-be) student of the social organization of innovation with a number of relevant analytical perspectives and tools to initiate his or her study. Moreover, the proposed conceptual framework helps to integrate the findings from different perspectives.

A second argument I can offer is that RAAKS' procedural design is systematic, it defines a number of steps, to delimit a domain of inquiry, to gather, organize and handle information, it defines particular intermediary and final outputs, and it sets standards for safeguarding the quality of its results. These have all been discussed in detail in chapters eight and nine. RAAKS studies may therefore be designed and evaluated with scientific rigour. However, to set standards is one thing, to comply with them is another. To obtain a constant quality under different circumstances requires much of the teams. Active participation and the achievement of intensive interactive communication and joint learning with relevant stakeholders and within the team are costly conditions, not only in money or time but particularly in terms of energy and commitment on the part of the research team. In practice, the management of such a process asks much of the group dynamics and communication skills of those involved. As a consequence, the training of researchers for using RAAKS as a research tool needs particular attention.

The third argument is of a practical nature. I believe research methodologies can contribute when researchers can adapt them to their needs, to their appreciation of a particular situation and to the issues they are interested in. In this sense, I think RAAKS offers flexibility. Each research team may redesign intentions, procedures and analytical perspectives according to their wishes, but, if they stick to the general outline of RAAKS, their experiences may be comparable to a satisfactory degree anyway. This was the (unverified) impression I obtained from our Central American case studies and the results various students obtained with (parts of) RAAKS. Clearly, a more profound inquiry would be necessary to confirm such an intuition.

I conclude that while RAAKS' can be ascribed the potential to contribute to scientific knowing, much more research is necessary to be able to know exactly how and when. In this sense, RAAKS is a true member of its tradition: the same observation is valid for most 'alternative systems of inquiry'. The professional interest these methodologies have already generated among development practitioners, researchers and policy-makers as well as among scholars studying processes of innovation and change is an indication of the relevance of such research.

10.7 Theatres, actors and interplay: concluding remarks

The impact of a metaphor

When I initiated this study I chose to describe my domain of interest as *complex theatres of agricultural innovation*. I felt that theatres (not plays or sceneries) are places where pre-meditated and spontaneous actions mix naturally, where managers, directors, designers, stage builders, actors and audience interact to produce both structure and serendipity. Even though I did not enact the metaphor in full detail during my studies, I feel it had a positive impact. In the first place it made me look at epi-phenomenal and random events. As in modern theatre, improvisation plays an role in preparing and executing innovation in complex theatres. Moreover "some things just happen....". Interesting enough, many of my respondents seemed to see the social organization of innovation as mostly random and/or epi-phenomenal anyway, or otherwise as something completely outside their span of control. The fatalistic 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. Yet, I discovered that many farmers and many managers of research and extension are what I would call innovation managers 'avant la lettre'. Many have reached an deep, often intuitive understanding of the way innovation is organized and put this to use daily for the benefit of their institutions. I became so much impressed that I came to doubt whether I would ever be able to add something of value to this enormous pool of practical knowledge. The enthusiastic support from some of them convinced me that scientific inquiry indeed could help.

In the second place, the theatre metaphor made me focus on 'interplay'. The more I studied innovation-related behaviour, the less I could deny that intuition, knowledge, ability and context go hand in hand to produce an 'effective innovation networker'. How do people make the choice with whom to speak at length, and whom to avoid? Why do they decide to test particular equipment and not to bother with others? Why does a certain

topic gain prominence among stakeholders and so many other, seemingly relevant ones not? Clearly, it is not simply a question of knowing, it may have to do with intuition, energy levels or the ability to take time of other activities. An early formative experience may serve as an example: one of the very first innovative pig farmers I interviewed in the Netherlands told me he often spent various days of the week away from his farm, in meetings with union members, on boards or councils or visiting institutes, companies or experimental stations. Also, he performed a number of innovative experiments at his own farm. I wondered how he could do all this without neglecting his farm. Then I met his wife. From what she told me I understood that he could only do all this because in fact his wife ran most of the farm together with a farm hand. Had his wife been a practising nurse, he would not have been the networker he is now! In other words, as far as networking is concerned, knowing how to do it is only part of the picture. Supporting oneself in the (family/friends) one already has, one tries out different contacts and relationships, taking long shots without knowing whether it is going to pay off. 'Playing around' is a large part of what successful networkers do.

In the third place, the theatre metaphor made it possible for me to avoid choosing between 'arena' or 'system'. Both of these metaphors I consider too partial to support a comprehensive inquiry into the social organization of innovation. Of course the social organization of innovation is partly a consequence of social design and regulation. As such it can be studied as a designed whole or 'system' in the traditional meaning of the word. But this is only part of the story. Knowing subjects continuously hammer at the foundations of such arrangements and through their interaction redesign and reorganize them. The same way, throughout history, many people have struggled to counteract what in their eyes was a skewed and equivocal perception of what innovation had to be. Such 'battles over images' can be studied as struggles or confrontations in a social 'arena'. But in how far would this divert our attention from the light-hearted and creative way so many social actors remodel the existing configurations daily, reinterpreting and reworking it as they see fit? Fortunately, the 'wielding and yielding' (Villareal, 1994) at the bottom-end of social innovation receives an increasing amount of interest from social researchers.

Softly organizing the theatre...

After having acquainted myself with soft systems thinking, its strengths and limitations (par. 2.3), and after having tried to develop a particular strand of it, appreciative knowledge systems thinking, I have convinced myself of the extreme relevance of the approach developed by Checkland c.s. for studying and tackling complex, social problems. My studies convinced me that soft systems thinking is a truly different strand of reasoning. But what is so different to it, and what does its appreciative thinking add to it? Basically, I think soft systems thinking is so valuable because it is compatible with the social constructivist tradition in social sciences. But at the same time it is very practical. The designers of soft systems methodology have understood we live in a 'world' not entirely of our own making, which we create and recreate permanently through our imagination and actions. The interplay between actors with different world views is the motor behind the learning process facilitated by soft systems methodology. What I think we added to it is (a) the notion of 'windows' as complementary analytical perspectives to enrich the interplay and (b) the focus on the social organization of innovation. With the use of windows, interplay and learning is fed by a confrontation of world views on the one hand, and analytical perspectives on the other, which helps to mimic the appreciative

character of networking for innovation. In the course of this study, the soft systems thinking, enriched this way, has proved to be a basis for structured inquiry into the social organization of innovation and an important tool for facilitating social problem solving and learning on complex issues. In my view soft systems thinking is receiving less attention from researchers than it deserves.

Towards a networking science?

My background is irrigation and drainage, then extension, then extension science. Now we dedicate ourselves to communication and innovation studies. Extensionists are typically 'brokers', go-betweens among members of a target group, specialists and researchers. As a consequence, extension science can be characterized as a 'broker science' (Gremmen, 1993). But a subtle change has crept into the domain of interest of extension science: while originally our efforts could be focused on one interface mostly, that of the farmer/specialist (or: patient/doctor, civilian/health worker, public/ environmental agency, etc.), today the social organization of innovation in agricultural as well as rural development has grown far more complex. With respect to the big issues: sustainable development, waste disposal, resource use negotiation, rural conflict resolution, reorientation of rural employment, climatological change, natural resource management, clean water supply, food distribution, etc. no clear problem definition nor readily available solutions exist. As a consequence, brokerage between specialists and end-users is no more relevant than intermediation between other stakeholders, such as national policy makers, traders, industrialists and retailers, farmer organizations, non-governmental organizations, local action groups or municipal governments, or between different members of each of these categories. As a consequence, we are shifting our emphasis from understanding and facilitating single interface interactions to understanding and facilitating simultaneous multiple interface interactions. The focus of our studies shifts to the simultaneous brokerage of images, knowledge and information between a variety of parties and to stimulating platform processes and 'joint performances' between stakeholders to solve complex social issues. It is time we find a name for such an applied networking science.

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Abstract

This study focuses upon the social organization of innovation. It makes use of insights from knowledge and information systems research, development sociology, management science and applied philosophy and seeks answers to the following questions: What do social actors, individuals and/or organizations, actually *do* to innovate their practices? How do they organize themselves? Can this be managed or facilitated, and if so, how? The research is exploratory rather than conclusion-oriented and synthesizes the results of over 50 case studies of agricultural innovation in 15 different countries, including the Netherlands. Its main results are a conceptualization of innovation as a social process and a participatory action-research methodology to enhance innovative performance. The methodology is based on soft systems thinking and offers a variety of 'windows' or analytical perspectives to help social actors analyze the way they are organized for innovation in an action-oriented fashion. The methodology has been field-tested in 15 areas in 7 different countries.

The author proposes that agricultural innovation can be looked at as resulting from the interplay between social actors representing relevant social practices. Social practices relevant to agricultural innovation include farming, research, extension, education, agro-industrial processing, marketing, mass media communication, policy-making, product quality control and the development, production, certification and distribution of inputs. Innovation then is a diffuse, social process of both individual and collective inquiry into intentions, alternative solutions and enabling and constraining conditions which leads to new or modified problem definitions and practical choices of solutions. The organization and quality of these inquiries eventually determine innovative performance at a certain point in time. What social actors actually do to innovate their practices can be understood as *networking*: social actors in search of relevant ideas, knowledge, information and experiences, continuously build and manage relationships with others which, by some standard, they consider relevant to innovating their practices. As a result of networking, over time forms of social organization of innovation emerge. These reflect dynamics of their own and are not fully describable or explicable in terms of micro-events.

The author proposes four such emergent forms to be relevant to students of complex innovation theatres: *Convergences* emerge when social actors narrow down the scope of their arguments and the range of issues and alternative scenarios they consider relevant to innovating their practices. *Resource coalitions* emerge when social actors decide to pool their resources in a joint performance. *Communication networks* emerge as a direct consequence of social actors' decisions to create joint learning opportunities and to produce and exchange information among themselves. Over time, where the above forms coincide, a pattern of more or less durable relationships between a limited set of social actors, an *innovation configuration*, may emerge. In such a configuration strategic consensus, a clear definition of tasks and responsibilities and a rational allocation of resources among social actors is possible. It also appears that each of these forms, but particularly the last one, may demonstrate inertia when faced with rapidly changing demands and/or circumstances. As a result, innovative performance may drop.

To enable social actors to assess their current way of organizing for innovation, a participatory action-research methodology is proposed: RAAKS, Rapid or Relaxed Appraisal of Agricultural Knowledge Systems. Its design is based upon 'soft knowledge systems thinking', combining the philosophy and guiding principles of soft systems methodology with analytical instruments from knowledge systems research. Through active participation of relevant social actors, RAAKS aims at a threefold objective: to raise awareness and understanding, to probe new alliances and to formulate proposals for action. It guides participants through an accumulative, interactive learning process leading from problem appraisal, via a joint inquiry towards the definition of potentially useful actions and/or interventions. In recognition of the appreciative character of innovation and its social organization, RAAKS offers a choice of perspectives or 'windows' to help stakeholders recognize, organize and debate relevant ideas and events. The conceptual approach mentioned above supports the integration of the findings into a more comprehensive understanding of the social organization of innovation in each particular case.

RAAKS has been field-tested over a dozen times in the Netherlands and in six countries in Central America. These experiences confirmed its relevance and applicability as a methodology, as well as its adaptability to particular demands and circumstances. RAAKS proved most useful in situations where, often ill-defined, feelings of unease persist among relevant stakeholders about the course innovation takes or its pace. It has proved useful in training (future) extension and research managers, and helping them to understand the context in which they operate. RAAKS also demonstrated its usefulness to those organizations or individuals who sell or provide 'knowledge/information intensive' products or services, such as research, extension and advisory services. It provides them with an instrument to appreciate the dynamic social context in which their products or services have to be marketed and are to prove themselves. Finally, due to its participatory character and soft systems design, RAAKS seems a promising instrument to help social actors organize themselves to deal with complex societal problems, which require higher levels of effective cooperation among stakeholders, such as natural resource management, regional development, stopping environmental degradation or waste disposal. Several experiences with RAAKS outside agriculture illustrate that its relevance to facilitating complex innovation processes is not limited to agricultural development as such.

As a general conclusion, the study points at the need to amplify research on knowledge management. To facilitate knowing between agencies and organizations, inter-organizational communication, whether direct or indirect, joint learning, sense making and resource pooling would have to become objects of study and eventually of (knowledge) management. Also, networking would have to be studied, its adequacy, effectiveness and efficiency in specific situations assessed and improvements designed and evaluated. The author argues that the challenge for management sciences with respect to social organization of innovation is 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. In addition, he proposes RAAKS may contribute not only to facilitating innovative social practice directly, but to scientific inquiry as well. For such a purpose, its potential and limitations do need to be further evaluated. In general, he suggests, soft (knowledge) systems thinking receives far less attention from the research community than it deserves.

Samenvatting

Deze studie richt zich op de sociale organisatie van innovatieprocessen. Zij bouwt voort op inzichten uit het onderzoek naar kennis- en informatiesystemen, de ontwikkelingssociologie, de bedrijfskunde en de toegepaste filosofie en zoekt een antwoord op de volgende vragen: Wat doen sociale actoren, individuen dan wel organisaties, eigenlijk om hun praktijken te vernieuwen? Hoe organiseren zij zichzelf daarvoor? En kan er iets aan gedaan worden om dit te managen of te faciliteren, en zo ja, hoe? Het onderzoek is niet conclusie-gericht maar exploratief. Het beoogt voor praktijk en wetenschap nuttige, nieuwe inzichten op te doen. Meer dan vijftig case studies betreffende de sociale organisatie van landbouwkundige vernieuwing in vijftien verschillende landen, waaronder Nederland, vormen de empirische basis voor het onderzoek. De belangrijkste resultaten zijn een aanzet tot theorievorming rond innovatie als sociaal proces en een aanpak voor participatief actie-onderzoek gericht op het bevorderen van het gemeenschappelijk innoverend vermogen van sociale actoren. De aanpak is gebaseerd op 'zacht systeem denken' en biedt diverse 'vensters' of analytische perspectieven aan, waarmee de actoren zelf de wijze waarop zij zich organiseren om te innoveren op een actie-gerichte wijze kunnen onderzoeken en beoordelen. Zij is op vijftien plaatsen in zeven verschillende landen uitgetest door middel van veldonderzoek.

Voorgesteld wordt landbouwkundige innovatie te zien als de resultante van sociale interactie tussen actoren die afkomstig zijn uit verschillende relevante sociale praktijken. Zulke relevante praktijken kunnen bijvoorbeeld zijn: het voeren van een landbouwbedrijf, het doen van onderzoek, het geven van voorlichting of onderwijs, de agro-industriële verwerking of vermarkting van landbouwprodukten, het maken van radio of televisieprogramma's ten aanzien van de landbouw, maar ook kwaliteitscontrole en de ontwikkeling, produktie, distributie en certificatie van inputs. Innovatie kan dan begrepen worden als een diffuus, sociaal proces waarbinnen het individuele en collectieve zoeken naar en onderzoeken van intenties, alternatieve oplossingen en bevorderende dan wel beperkende factoren leidt tot nieuw zicht op de problematiek en tot praktische keuzen voor bepaalde concrete oplossingen. De wijze waarop deze zoekprocessen zijn georganiseerd, en hun kwaliteit, bepalen dan uiteindelijk hoe het innovatieproces verloopt en wat het resultaat zal zijn. Wat sociale actoren nu eigenlijk doen om hun praktijken te vernieuwen, kan worden geduid met de term *netwerken*: op zoek naar relevante ideeën, kennis en informatie, bouwen actoren continu aan relaties met anderen die zij, om de één of andere reden, relevant vinden voor hun streven naar innovatie. Als gevolg van dit netwerken ontstaan met de tijd specifieke vormen van sociale organisatie voor innovatie. Deze vertonen een eigen dynamiek en zijn niet volledig te beschrijven of uit te leggen vanuit de gebeurtenissen op microniveau.

De auteur stelt voor dat vier van dergelijke sociale organisatievormen van belang zijn voor diegenen die complexe innovatietheaters willen onderzoeken: *convergenties* treden op wanneer sociale actoren de 'bandbreedte' in hun argumentatie vernauwen, de onderwerpen afbakenen en de alternatieve oplossingen die (nog) worden onderzocht beperken; *coalities* rond leidinggevende actoren zien we optreden wanneer sociale actoren besluiten

hun middelen samen te voegen teneinde een bepaald soort vernieuwingen een kans te geven; en *communicatienetwerken* ontstaan als directe consequentie van de besluiten die actoren nemen om gemeenschappelijke leerervaringen te creëren en om informatie te produceren en onderling uit te wisselen. Naarmate de tijd voortschrijdt en als bovengenoemde vormen meer en meer gaan samenvallen, kan tussen een beperkt aantal actoren een patroon van min of meer duurzame relaties ontstaan, een *innovatieconfiguratie*. In zo'n configuratie is tussen de deelnemende actoren overeenstemming mogelijk met betrekking tot strategische doelen, een duidelijke definitie van taken en verantwoordelijkheden en een rationele allocatie van middelen. Het lijkt zo, dat elk van de genoemde vormen, maar in het bijzonder de configuraties, traagheid vertonen wanneer zij geconfronteerd worden met snel veranderende eisen en/of omstandigheden. Dit kan een negatieve uitwerking hebben op de mate waarin door de betrokkenen geïnnoveerd wordt en op de relevantie van het soort innovaties dat wordt gerealiseerd.

Om sociale actoren te ondersteunen in het onderzoeken en beoordelen van de wijze waarop zij zich hebben georganiseerd om te innoveren, wordt een participatieve actie-onderzoeksaanpak voorgesteld: RAAKS (Rapid of Relaxed Appraisal of Agricultural Knowledge Systems). Het ontwerp van deze aanpak is gebaseerd op 'zacht kennissysteem denken', een combinatie van de filosofie en principes van de zachte systeembenadering met analytisch instrumenten uit het kennissysteemonderzoek. Door middel van actieve participatie van de betrokkenen zelf probeert RAAKS drie elkaar aanvullende doelstellingen te verwezenlijken: de aandacht voor en het begrip van de sociale organisatie van innovatie te vergroten, nieuwe vormen van communicatie en samenwerking tussen de actoren af te tasten en tot formulering van concrete actie-voorstellen te komen. RAAKS gidst de deelnemers als het ware door een interactief, accumulatief leerproces leidend van een heroverweging van de geformuleerde problemen, via een gezamenlijk onderzoek van de sociale organisatie voor innovatie, naar een definitie van mogelijk zinvolle acties en/of interventies. Gezien het appreciatieve karakter van innovatie en de sociale organisatie eromheen, biedt RAAKS de deelnemers een ruime keuze van 'windows' of onderzoeksperspectieven aan die hen kunnen helpen relevante ideeën en gebeurtenissen te onderkennen, te structureren en te bespreken. De theoretische benadering die hierboven is uiteengezet helpt de groep erbij op grond van haar bevindingen voor zichzelf een vollediger beeld te scheppen van de sociale organisatie van innovatie in ieder specifiek geval.

RAAKS is vijftien maal uitgetest in veldsituaties, in Nederland en in zes landen in Midden-Amerika. Deze ervaringen bevestigden de relevantie en toepasbaarheid van de aanpak, alsook de mogelijkheid haar aan te passen aan specifieke eisen en omstandigheden. RAAKS bleek vooral zinvol in situaties waar belangrijke actoren, vaak slecht omschreven gevoelens van onbehagen koesterden met betrekking tot de koers die innovatieprocessen namen of de snelheid waarmee innovaties werden gerealiseerd. Zij is bruikbaar gebleken in de training van (toekomstige) managers van voorlichtings- en onderzoeksinstituten. Zij leerden hierdoor de context van sociale relaties waarbinnen zij dienen te opereren beter kennen en begrijpen. RAAKS bleek ook nuttig voor organisaties of individuen die 'kennis/informatie-intensieve' produkten of diensten verkopen dan wel leveren, zoals onderzoeksinstellingen, voorlichtings- en adviesbureau's. De aanpak geeft hen een instrumentarium om de dynamische sociale context waarbinnen hun produkten of diensten afgezet dienen te worden en een toegevoegde waarde dienen te realiseren op waarde te schatten. Vanwege haar zachte systeem ontwerp en participatieve opzet tenslotte

lijkt RAAKS een veelbelovende aanpak om sociale actoren te ondersteunen bij het zich organiseren om complexe maatschappelijke problemen aan te pakken die hogere niveaus van samenwerking vereisen, zoals het management van natuurlijke hulpbronnen, regionale ontwikkeling, het stoppen van milieu-degradatie of het verwerken/afvoeren van afval. Verschillende ervaringen met RAAKS buiten de landbouw hebben geïllustreerd dat de relevantie ervan voor het faciliteren van complexe innovatieprocessen niet beperkt is tot landbouwontwikkeling als zodanig.

Als algemene conclusie wordt gesteld dat het onderzoek naar kennismanagement uitbreiding behoeft. Om het kennen, als eenheid van leren en doen, tussen organisaties te bevorderen dienen de communicatie tussen organisaties, of die nu direct is of indirect, het gemeenschappelijk leren en zingeven aan ideeën en gebeurtenissen en het bundelen van middelen voor innovatiedoeleinden onderwerp van onderzoek en uiteindelijk van (kennis)management te worden. Zo ook zou het netwerken zelf grondiger moeten worden bestudeerd, zodat de zin, effectiviteit en efficiëntie ervan in specifieke situaties nauwkeuriger kan worden vastgesteld en verbeteringen kunnen worden ontworpen en geëvalueerd. De auteur stelt dat de uitdaging die de sociale organisatie van innovatieprocessen stelt aan de managementwetenschappen is een balans te vinden tussen aan de ene kant sturing en controle en aan de andere kant het creëren en het behouden van ruimte voor onbedoelde en onverwachte verbeteringen, die ontstaan uit een min of meer toevallige samenloop van handelingen en omstandigheden. Daarnaast oppert de auteur de mogelijkheid dat RAAKS niet alleen bruikbaar is voor het faciliteren van de innovatieve sociale praktijk, maar ook als aanpak voor wetenschappelijk onderzoek. Daarvoor dienen echter haar mogelijkheden en beperkingen nader te worden onderzocht. De onderzoeksgemeenschap, stelt hij, besteedt in het algemeen veel minder aandacht aan de zachte (kennis)systeemleer dan deze verdient.

About the author

Paul Gerard Hendrik Engel was born in The Hague, the Netherlands, on March 14th, 1949. In 1967, he completed Gymnasium B at the 2nd Vrijzinnig Chirstelijk Lyceum, also in The Hague. In 1976, he obtained his M.Sc. degree in tropical irrigation and drainage at the Wageningen Agricultural University. His main topics were irrigation water use and extension science. During his studies he chaired one of the students' clubs, worked part-time with the Institute for Applied Extension Science and participated in the research project 'The Small Farmer and Development Cooperation' at the International Agricultural Centre in Wageningen. As a student he did a year of practical field work in Chile, South America.

From 1976 to 1977, as member of a team of researchers, he was commissioned to investigate the impact of a Dutch bilateral agricultural extension project in Perú. From 1977 to 1981, he joined FAO as an extension communication specialist and was in charge of small-scale irrigation development in the Upper Region of Ghana, West Africa. In 1981, he started as an extension and communication specialist for a bilateral agricultural development project in the Nariño Highlands, Colombia. In 1982 became the project manager of this project, in charge of a multidisciplinary team of specialists. In 1985 he was appointed Programme Director for the International Extension Programme of the Ministry of Agriculture and Fisheries in the Netherlands. He also joined the International Course on Rural Extension, at the International Agricultural Center, as a lecturer, trainer and executive committee member. He was also a consultant for ISNAR, the International Service for National Agricultural Research, and took part in its Research/Technology Transfer Linkages Study as a researcher and core group member.

As from 1988, he joined the Agricultural University of Wageningen, the Netherlands. At the Department of Communication and Innovation Studies he fulfils duties as a researcher and lecturer in the fields of knowledge (systems) management as well as the management of information and advisory services. In addition, he does consultancies both in the Netherlands and abroad, mostly in Central and South America. He works closely with a number of non-governmental development organizations in the fields of sustainable and rural development. Since 1988, he publishes regularly in both professional and scientific journals.

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List of abbreviations and acronyms

ACDEP	Association of Church Development Projects, Ghana (Alebikiya, 1993)
AFSR/E	Association for Farming Systems Research and Extension
AGRARIA	Non-Governmental Agricultural Development Organization, Chile
AGROCOM	Organization providing electronic information services to farmers in the South of the Netherlands
ANDRI	Asociación Nacional de Usuarios DRI, Colombia
AKIS	Agricultural Knowledge and Information System (Röling, 1992)
ALIN	Arid Lands Information Network, East and West African Sahel (Graham, 1993)
ASOCUY	Asociación de productores de cuyes (Guinea pig producer association), Nariño, Colombia
BAVARIA	Beer manufacturer in Nariño, Colombia
CA	Caja Agraria (Agricultural Development Bank), Colombia
CAME	Concejo Andino de Manejo Ecológico (Andean Council of Ecological Management), Perú (Manrique et al., 1993)
CEE	Comunidad Económica Europea (EEC)
CENTA	Centro de Tecnoloía Agrícola, El Salvador
CIAT	Centro International de Agricultura Tropical, Colombia
CIDT	Compagnie Ivorienne des Fibres Textiles (Ivory Coast textile fibres company)
CIRAD	Centre de coopération Internationale de Recherche Agronomique pour le Développement, France
COOPROLACTEOS	Cooperativa de Productos Lacteos de Nariño, Colombia
CORFAS	Non-Governmental Organization providing credit to urban and rural associations, Colombia
CRECED	Centro Regional de Capacitación, Extensión y Difusión de Tecnología (Regional Training, Extension and Technology Diffusion Centre), ICA, Colombia
CvO	Commissie van Overleg, platform horse sector, the Netherlands
DLV	Dienst Landbouwvoorlichting (privatized Dutch extension service)
DPI (Qld)	Department of Primary Industries, Queensland, Australia
DRI	Desarrollo Rural Integrado (Integrated Rural Development programme), Colombia
EC/EEC	European Commission/European Economic Community
ETC	Development Consultants, Leusden, the Netherlands
FAO	Food and Agricultural Organization of the United Nations
FLACSO	Facultad Latino Americana de Ciencias Sociales, Chile
IAC	International Agricultural Centre, Wageningen, the Netherlands
ICA	Instituto Colombiano Agropecuario
ICA-CCH	Convenio Colombo Holandés (Colombo-Dutch Bilateral Agricultural Development Project), Nariño, Colombia

ICRA	International Course on Research in Agriculture, IAC, Wageningen, the Netherlands, and CIRAD, Montpellier, France
ICRE	International Course on Rural Extension, IAC, Wageningen, the Netherlands
IICA	Instituto Interamericano de Cooperación para la Agricultura (Inter-american agricultural cooperation institute)
IIED	International Institute for Environment and Development
IKC	Informatie- en Kennis Centrum (Reference Centre, Ministry of Agriculture, Nature Management and Fisheries, the Netherlands)
ILEIA	Information Centre for Low External Input and Sustainable Agriculture, the Netherlands
INDECA	Instituto Nacional de Comercialización Agrícola, Guatemala
ISNAR	International Service for National Agricultural Research, The Hague, the Netherlands
KIS	Knowledge and Information System (Röling, 1992)
KIT	Royal Tropical Institute, the Netherlands
KMN	Knowledge Management Network, the Netherlands
KWPN	Koninklijk Warmbloed Paardenstamboek Nederland (National horse breeding association), the Netherlands
LEISA	Low External Input and Sustainable Agriculture
MSICA	Manejo de Sistemas de Información y Conocimiento Agrícola (name of training sessions with Central American RAAKS teams (see: chapter 9)
NCC	National Coordinating Committee ICA-CCH
NCDP	National Coconut Development Programme, Tanzania
NGDO	Non-Governmental Development Organization
NGO	Non-Governmental Organization
NOVEM	National Organization for Energy and Environment, the Netherlands
NOVIB	Dutch non-governmental donor agency
OBL	Organization for producing bio-ethanol from agricultural products
OXFAM	British non-governmental donor agency
PCTT	Planes de Comunicación para la Transferencia de Tecnología (Communication plans for technology transfer), ICA, Colombia
PRIAG	Programa Regional de Reforzamiento a la Investigación Agronómica sobre los Granos en Centroamerica
PRA	Participatory Rural Appraisal (Chambers, 1992)
PUBLEICA	Committee in charge of publications at ICA, Colombia
RAAKS	Rapid Appraisal of Agricultural Knowledge Systems
RTTL	Research Technology Transfer Linkages (study) (Kaimowitz, 1990; Eponou, 1993)
SSM	Soft Systems Methodology (Checkland & Scholes, 1990)
STOAS	Consultants for Agricultural Education, Training and Development, the Netherlands
URADEP	Upper Regional Agricultural Development Programme, Ghana
WAU	Wageningen Agricultural University, the Netherlands
WHO	World Health Organization
WUB	Wagenings Universiteitsblad (Wageningen University Weekly)

Annex

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