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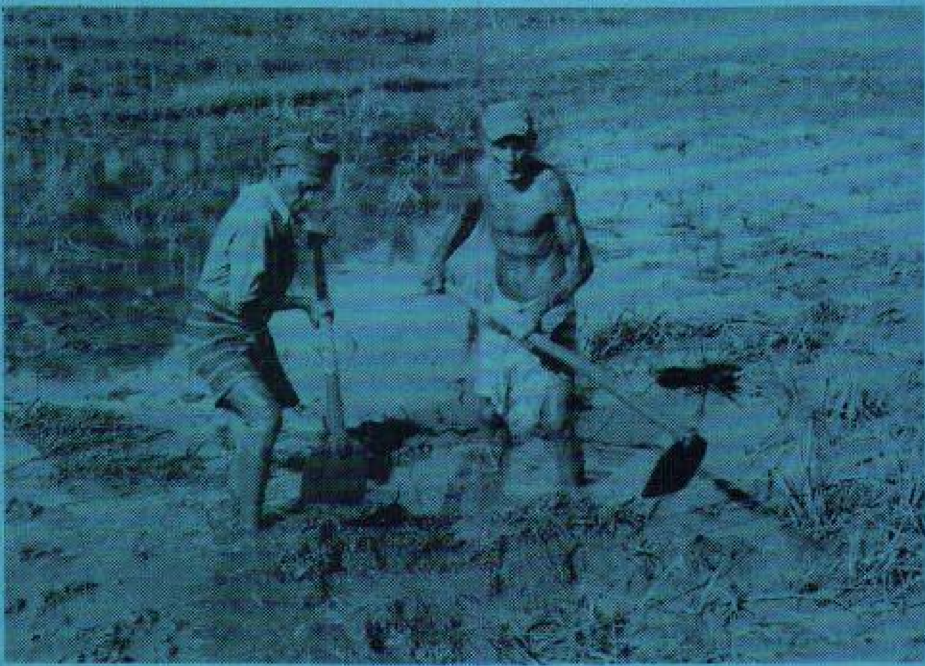
FARMER, EXTENSION AND RESEARCH IN SRI LANKA



An empirical study of the agricultural knowledge system with special reference to Matara district

Mahinda Wijeratne

Statements

FARMER, EXTENSION AND RESEARCH IN SRI LANKA

Mahinda Wijeratne,
Wageningen,
1st June 1988.

Statements

(a) Farmers are engaged in research. Hence, indigenous knowledge is an important element in the technology development.
(Source: this dissertation, p 122)

(b) Knowledge storage and retrieval by village extension workers are two important processes which are seriously neglected in the T&V system.
(Source: this dissertation, p 116-117)

(c) An index measuring the adoption of innovations by local farmers can be used as a tool for segmenting them into homogenous categories for purposes of technology development and extension. However, separate indices are necessary for different agro-ecological zones.
(Source: this dissertation, p 171-172)

(d) Field extension workers can have a considerable influence on the choice of recommendations that are appropriate to the conditions of the clients. Therefore, lower level extension workers should be given more power to decide on the extension offering.
(Source: this dissertation, p 94)

(e) The degree of similarity of the educational status of the officers concerned, is one of the essential variables governing research-extension linkages.
(Source: Seegers and Blok, 1988)

(f) Follower farmers have acquired the same knowledge on extension recommendations as the contact farmers.
(Source: this dissertation, p 193)

(g) Vocational education in agriculture at the secondary school level helps to meet the skilled manpower requirement.

(h) The subject streams of the Sri Lankan school curriculum are much oriented towards university entry and have paid little attention to entry into technical fields.

(i) Scientists feel that they have 'no time' to lose as their career advancement normally depends upon the number of publications and citations.

(j) Once you study, you forget; once you study more, you forget more, then **why** study?

Mahinda Wijeratne

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An empirical study of the agricultural knowledge system with special reference to Matara district

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PROEFSCHRIFT
ter verkrijging van de graad van doctor
in de landbouwwetenschappen, op gezag van
de rector magnificus, prof. dr. C. Oosterlee,
in het openbaar te verdedigen op woensdag
1 juni 1988 des namiddags te vier uur in de
aula van de Landbouwuniversiteit te Wageningen.

Promotor: dr. ir. N.G. Röling, hoogleraar in de voorlichtingskunde

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GLOSSARY

AI	Agricultural Instructor
AKS	Agricultural Knowledge System
AEARP	Agricultural Extension and Adaptive Research Project
AO	Agricultural Officer
AOs HQs	Agricultural Officers Head Quarters
ASCs	Agricultural Service Centers
ARTI	Agricultural Research and Training Institute
CFs	Contact Farmers
CO	Cultivation Officer
DTC	District Training Center
FFs	Follower Farmers
FSR	Farming Systems Research
HYVs	High Yielding Varieties
KVS	Krushikarma Viyapthi Sevaka (village extension worker)
RED	Research-Extension Dialogue
ROs	Research Officers
RRC	Regional Research Center
RTC	Regional Training Center
RTWGs	Regional Technical Working Groups
SMO	Subject Matter Officer
SMOs HQs	Subject Matter Officers Head Quarters
SMO (OFC)	Subject Matter Officer (Other Field Crops)
SMO (P)	Subject Matter Officer (Paddy)
SMO (PP)	Subject Matter Officer (Plant Protection)
SMSs	Subject Matter Specialists
ToT	Transfer of Technology
T&V	Training and Visit System of Agricultural Extension
VEW	Village Extension Worker

FOREWORD

Purpose

The efficiency of agricultural production increases continuously through the application of scientific knowledge. Agricultural development programmes often aim to improve the generation, transfer and utilization of knowledge. Increase in total production and average yield are often found to be the variables used to measure the return to investment of such development efforts. Many studies underpin the positive trends observed in total quantum or/and average yields of many food crops especially in Asia. Some developing countries even experience an overproduction of grains. On the other hand, small farmers are forced out of agriculture as their units prove increasingly unviable. Research is often not directed at small farmers' problems. Hence, technology development to solve small farmers' problems does often not take place. Therefore, a concern for rural development in the medium term is to mount strategies which at least allow small farmer households to retain a sustainable subsistence. This is a valid concern as the majority of the farm population in most developing nations belongs to the small farm sector and have few alternative sources of livelihood. In Asia, 55 per cent of the farms are 1 ha or below and 73 per cent are 2 ha or below (World Bank:1982:78). In Sri Lanka, the average farm size of the small holding sector is approximately 0.8 ha or 1.9 acres, with 42 per cent of the holdings having less than 1 acre (0.4 ha). Today, we therefore need alternative strategies to deal with small farmers' problems. Part of the failure to evolve such strategies stems from lack of theoretical underpinning, specially on the part of extension science. Fortunately, this problem is now receiving much attention.

Recent developments in extension science have been influenced by several factors. First, extension is increasingly seen as a policy instrument to induce voluntary behaviour change. Second, as physical and economic constraints to agricultural production are removed, the growth of the productivity becomes more directly dependent on the synergic functioning of research and extension. Hence, extension is increasingly seen as a component of an agricultural knowledge system. The **Agricultural Knowledge System (AKS)** model has provided a new perspective for the development of extension science. The model emphasizes that research, extension and utilizers are not separate entities or departments but rather inter-dependent elements in the technology innovation process. This realization stimulated the use of the systems approach to understand the reasons for problems experienced in technology development and utilization.

Agriculture is the main income earner in the Sri Lankan economy. The livelihood of the majority of the population is based on agriculture and agro-based industries. Alternative employment opportunities are severely limited, specially in the rural sector which accounts for 79 per cent of the population. Hence, the need for rapid agricultural development has been widely recognized. Today, more and more agricultural land is being developed under large irrigation projects especially in the dry zone; new crops and cropping patterns are introduced; farm mechanization and input use are becoming increasingly popular; the demand for basic ingredients for agricultural development is increasing; new markets are growing for agricultural products; agricultural information receives much attention; large investments are made in agricultural projects and the need for trained manpower in agriculture is increasingly apparent. All these have implications on **demand** for agricultural knowledge. The **supply** of agricultural knowledge is facilitated by investing in research, training and training materials, the opening of new Agricultural Faculties etc. For optimum knowledge utilization, demand and supply of agricultural knowledge should meet. This in turn, requires effective interfaces between research, extension and farmer as well as effective processes of technology development, information exchange and feedback.

The **Training and Visit (T&V) System of Agricultural Extension** has been deliberately introduced to fulfil this requirement. The T&V system seeks to increase the interconnectedness between AKS elements (Röling:1988). However, in many developing countries, the system is in the infant stages of implementation. As few extension scientists are engaged in research, empirical investigation of its field impact has been limited. This study reports on such an empirical investigation. In doing so, it contributes to the fast growing body of knowledge of Extension Science. The investigation has been carried out in Matara district, Sri Lanka, home of the University of Ruhuna at which I am presently employed. Matara is an agricultural area dominated by small scale rice farmers. Thus two factors captured my interest to undertake this research —- extension science on one hand and small farmers on the other.

Outline of the text

This text is divided into four parts. Part I provides the introduction. Part II describes the situation which provides the context for the study while part III gives some aspects of extension theory. Part IV presents the findings and conclusions. Since the study is based on two different samples and three separate analyses, methods used will be described where appropriate. Hence, the traditional chapter lay-out was not followed. The introductory chapter, the only chapter in part I explains the objectives of the study. The second chapter provides a description of the study location. The third discusses the status of the small farmer, the farming systems and the dynamics affecting the socio-economic position of the small farmer. A detailed description of the rice farmers in the area is found in chapter four based on a survey carried out by the author. The fifth chapter outlines the development of the extension system in Sri Lanka, including the formal T&V model. Chapter six, the first chapter of part III gives an overview of extension in agricultural development. Chapter seven provides the conceptual framework for the first research problem — extension coverage. The eighth chapter explains the development of AKS models and serves as conceptual base for the second research problem —- knowledge dissemination. Chapters nine and ten present the findings for the two research problems which are mainly based on the quantitative analysis. Finally, chapter eleven draws conclusions and makes suggestions for future research.

Throughout the text, wherever possible, British units with their metric equivalent were used to present the data but, unavoidable circumstances led me to use metric units sometimes. It has to be mentioned that the policy is to adopt metric units but in practice, British and local units are still found. This has made it difficult to be consistent.

Readership

The text addresses extensionists, researchers, project designers, policy makers and university students, especially in Sri Lanka. I hope that the readers will find the experiences documented in this study of value to their work especially as locally developed training materials are limited.

Acknowledgements

With great appreciation, I thank the Agricultural University, Wageningen, the Netherlands, for granting me the opportunity to read for a doctoral degree as the first foreign doctoral scholar of the Department of Extension Science. I should not pass the opportunity to thank the State University of Ghent, Belgium, where I obtained my MSc, for giving me the intellectual stimulus to continue post-graduate studies.

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I extend my gratitude to Kees Blok, Stephan Seegers, Miuru Dharmasena and the under-graduate students of the Faculty of Agriculture, University of Ruhuna, for the full support granted me during the field work. I thank Somasiri, Piyasiri, Premeratne and Obeytilaka for their co-operation. It may be strange to say here, but I have to reveal a fact which dragged me into difficult situations: two-year long field investigation was not financed by any source. Fortunately, in many instances, I was lucky enough to receive invaluable human resources free at my disposal. Personal contacts are a mighty instrument for solving problems indeed.

I specially thank my colleagues, Kumara Samaranayake, Mangala and Damayanthi de Zoysa, Ineke Pardoen and the staff members of the Department of Extension Science, Agricultural University, Wageningen, for their enormous helps and encouragement. Also I thank Piet Holleman for making figures for the text. I greatly appreciate all the pleasing support granted to me by the secretaries, Willie van Wijde, Joke Janssen and specially by Greet Brouwer, for applying her word processing skills to the final manuscript.

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I am much grateful to my parents, sister and two brothers for their patience, sacrifices and encouragement of my intellectual pursuits.

Finally, to Wim and all the colleagues who made my stay in the Netherlands pleasant and homely, I say, **Dank U wel**.

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Part I

INTRODUCTION

Chapter 1

PROBLEM AND OBJECTIVES

1.1 Agricultural extension in Sri Lanka

1.1.1 Area of discourse

In developing countries, small scale farmers encounter a great number of limitations in the production of food. Unavailability of production factors, together with unstable prices, poor soil fertility, unfavourable weather conditions, inaccessible services, and lack of rural organizations are often found to be the main constraints confronting the small farmer. Conventional development programmes are often concentrated on the development of technological innovations, but not on delivery mechanisms. In many instances, priorities in crop and livestock research have reflected biases in assessing what matters to rural people and further, have ignored rural peoples' own knowledge (Chambers: 1983:75). Technology development has largely served resource-rich farmers, as investments in research and extension often benefited them. Generally, a distinction can be made between labour and land saving technologies. Lipton and Longhurst (1985) have demonstrated that land saving technologies, such as modern varieties, have increased the productivity of small farmers as well as of large farmers, but large farmers often obtain the innovators' rent. Agricultural research has had a discouraging record of developing technology which often was not appropriate for small farmers. As a result, part of the failure of agricultural extension with small farmers stems from lack of messages which fit their objectives and conditions (Chambers and Jiggins:1987). Many alternative strategies have been evolved but, in practice, they can be regarded as modification of the conventional **Transfer of Technology (ToT)** model. The recent development of Farming Systems Research recognizes the major shortcomings of the experiment station-based technology development, arguing that it is necessary to learn from the farmers (Davidson: 1987). However, FSR's practical application and contribution to overall agricultural development are still limited.

Today, it has been widely recognized that techniques for disseminating new knowledge have not progressed enough to deal with farmers problems (von Blanckenburg: 1984) and that an effective knowledge dissemination system provides a vital tool for increasing agricultural productivity (Pickering: 1983:03). Such realizations reinforced the vital need for a strong extension component in agricultural development efforts. Agricultural extension has long been neglected in developing countries. It was only in the sixties that its substantial impact on agricultural production began to be generally recognized. Even though, during the past, measures have been taken to strengthen agricultural extension they were often not sufficiently dynamic to allow extension to cater for the needs of the rural mass. In this situation, the well-known **Training and Visit (T&V)** System of Agricultural Extension was born (Benor and Harrison: 1977, Benor et al: 1984). This approach has received considerable attention from donor organizations and more than forty developing countries have adopted it.

The **Agricultural Knowledge Systems (AKS)** paradigm gives a new direction to the thinking of researchers, extensionists, policy makers and other personnel involved in agricultural development (Röling:1985). I shall not go into details of the AKS model at this point, as a detailed treatment will be presented in chapter 8. In essence, the components of the AKS can be said to be calibrated along a science/practice continuum, reflected in such sequences as: science, technology generation, technology testing, technology adaptation research, technology integration, technology dissemination, technology diffusion and adoption (Mc-

Dermott:1987:91). The key issue is the way scientific knowledge and information is transformed into useful technology and then into desired farm innovation. Essential processes, such as knowledge generation, transformation, storage, dissemination, utilization etc. are not confined to certain components, but are performed by almost all the components of the AKS (Engel:1987b:23a).

In all, the AKS model incorporates the essential elements and processes in the development, transfer and utilization of technology and further, places them in a perspective of synergy. The AKS model can be utilized as an analytical tool to investigate existing knowledge and information systems. Further, it serves as a base to design future development strategies. The T&V System of Agricultural Extension can be seen as a deliberate tool to improve the interconnectedness of the different components of the AKS (Röling:1988a). This study uses AKS concept to investigate the T&V system as it actually operates in the field, Matara district in Sri Lanka.

1.1.2 Overview

Sri Lanka is a small island located in the Indian ocean. Including large inland waters, it covers 25,629 sq. miles (65,610 sq.km). In 1985, the mid-year population was estimated to be 15.8 M inhabitants, with a 1.5 per cent population growth over the previous year (Central Bank: 1985a:03). The country's economy depends for a large part on agricultural production. The agricultural economy has shown a dualistic nature having a plantation sector and a rural sector. The plantation sector mainly concentrates on export earnings while the rural or peasant sector devotes its main efforts to the nation's staple food crop, rice. In all, the agricultural sector has contributed one-fourth of the country's GDP (Central Bank: 1985a:01), has earned 52.5 per cent of foreign revenue in 1985 (Central Bank:1986:12), and has a share of 50 per cent of the total employment. In the development effort, agricultural research and extension have been identified as main components for immediate improvement but, like in many other developing countries, until the recent past, the extension component has received less attention. Even though some extension reforms have taken place during the past two decades, it has been observed that the extension framework is confused and unsatisfactory (World Bank :1979:09). The introduction of the T&V system marked a major breakthrough in extension history. However, in Sri Lanka, the system is still in its infant stage of implementation and further, very few empirical studies have been undertaken (von Blanckenburg et al: 1980, Griffith: 1984, Wijeratne: 1984, Department of Agriculture :1985, Sivayoganathan: 1985). Therefore, current and future research on the T&V system is essential to evaluate its effectiveness and to allow modifications if any shortcomings are observed.

1.1.3 The T&V strategy

The T&V system of extension has been widely adopted in developing countries since the mid-seventies. The essence of this approach is a structured work programme for extension agents based on a schedule of regular and time-bound visits to Contact Farmers (CFs); technical training and updating sessions for extension agents; a hierarchical organizational network and exclusive devotion to extension work. One of the expected benefits of this management system is to assure the mobility of extension agents, and thus extend the extension coverage to a wider area and larger number of farmers (Feder et al:1985a:02, Blum and Isaac:1988). The system was first experimented in Turkey in the late sixties and showed tremendous success in terms of the improvement of total production (Benor and Harrison: 1977:03). Sri Lanka is among the pioneers which implemented the T&V system. It was introduced in 1976 as a pilot project in a dry zone district and subsequently adopted in all the other districts from Maha season 1979/80 onwards (Ranaweera and Silva: 1982:01, Department of Agriculture: 1985:06). Prior to island-wide adoption, evaluation studies have been undertaken in many districts. Griffith (1984) has stated that appraisal of a wet-zone district has shown satisfactory results. The country-wide implementation of the system has been negotiated with the World Bank and financial assistance was granted under the Agricultural Extension and Adaptive Research Project (AEARP) (Department of Agriculture: 1985:02). As in many other countries, it has been discovered that since the initiation of the project, average yields and total production have increased significantly. An evaluation study conducted by the Department of Agriculture (1985:02) has revealed that average yields of paddy (unhusked rice) have increased from 52 bu/ac (2,704 kg/ha) in 1979 to

60 bu/ac (3,120 kg/ha) in 1985. Consequently, total production has shown a positive trend by increasing from 2.0 M metric tons in 1979 to 2.4 M metric tons in 1985.

1.2 The share of the small farmer

1.2.1 The small holding sector

Sri Lankan agricultural production mostly rests on small scale farmers. An agricultural holding of less than 20 acres under the same operational status is considered as a small holding (Department of Census and Statistics: 1982a:04). Recent statistics show that the small holding sector accounts for 99 per cent of the total number of holdings and for 73 per cent of the cultivated area. In absolute numbers there are 1.8 M operational holdings which cover an area of 3.5 M acres (1.4 M. ha). The distribution of small holdings in Sri Lanka is illustrated in Table 1.2.1. This table reveals that 42 per cent of small holdings operate less than one acre (0.4 ha) and they account for only 8 per cent of the land area in the small holding sector. In total, there are 1.8 M operators in this sector and the average area per holding has been estimated to 1.9 acres (0.8 ha).

When the average size of holdings is analysed by size class, the distribution of the holdings seems to be skewed with a large number of them grouping in the lower part of each class. Even within the size class of less than 1 acre (0.4 ha), the majority of holdings is less than half an acre (0.2 ha).

Agriculture is the main income-generating activity in Matara district also. The small holding sector dominates the district's agriculture with 78 per cent of cultivated acreage, 99 per cent of agricultural holdings and 99 per cent of agricultural operators (full-time and part-time farmers). Further, the average area of the small holding sector has been estimated to be 1.6 acres (0.6 ha). The recent statistics in the district reveal that 46 per cent of the holdings are less than one acre and account for 11 per cent of the total acreage in the small holding sector. Further, it is important to state that, during a ten year period, the number of holdings

Table 1.1: The distribution of small holdings in Sri Lanka, 1982.

Size class (acres)	Percentage of holdings	Percentage of area
Less than 1	42.4	8.1
1 - less than 2	21.9	14.2
2 - less than 3	13.6	15.5
3 - less than 20	22.1	62.2
All classes	100.0	100.0

Source: Department of Census and Statistics: 1982b:09
1 acre = 0.405 ha

less than one acre has increased by 21 per cent while the acreage for the same size class has increased by 24 per cent (Department of Census and Statistics: 1982b:29).

1.2.2 The paddy sub-sector

Within the Sri Lankan small holding sector, paddy small holdings represent the higher share (a paddy holding refers to one or more parcels of land under one management status which are prepared for rice cultivation). It is evident that 40 per cent of small holdings belong to the paddy sub-sector which amounts for 33 per cent of total area of the small holding sector (Table 1.2.2). Further, paddy small holdings represent 99 percent of the total paddy holdings in the country which cover 94 per cent of the total paddy acreage. In comparison with national figures, Matara district has a higher share of paddy small holdings in its small holding sector. However, the share of paddy in total acreage is similar to the national figures (Table 1.2.2). Furthermore, the total acreage under paddy and total number of paddy holdings in the district are almost totally accounted for small holdings.

Table 1.2: The share of paddy small holdings in the small holding sector in Sri Lanka, 1982.

	Small holding sector	Paddy small holdings	Percentage of paddy small holdings
No of holdings	1,807,697	730,780	40.4
Area (acres)	3,531,248	1,146,692	32.5
	(1,412,514 ha)	(458,677 ha)	

Source: 1. Department of Census and Statistics:1982b:09.
2. Department of Census and Statistics:1982c:63.

Table 1.3: The share of paddy small holdings in the small holding sector in Matara district, 1982.

	Small holding sector	Paddy small holdings	Percentage of paddy small holdings
No. of holdings	95,920	58,100	60.6
Area (acres)	148,032	53,878	36.4
	(59,213 ha)	(21,551 ha)	

Source: Department of Census and Statistics:1982a:25.28-29.

1.3 Objectives of the study

From the outset, the study has had three objectives. Two of them refer to empirically based knowledge claims which the study seeks to make, and the other refers to contributions of the study to various social goals. The objectives are:

1. Gaining knowledge with respect to the coverage of the farming population by the extension service under the T&V management system.

2. Gaining knowledge with respect to the flow of information through research and extension under the T&V management system.

3. Making contributions to:

   - empirical knowledge about the functioning of the T&V system in Sri Lanka,
   - extension training in Sri Lanka,
   - the body of knowledge of extension science.

In the following sections each of these objectives will be briefly discussed.

1.4 The first scientific objective: Extension coverage in the Sri Lankan AKS

The preceding paragraphs demonstrated the importance of rice small holders in the country as well as in Matara district. The first objective of the study is to analyse the coverage of small farmers by extension visits/contacts. **Coverage refers to the extent to which farmers in a category or social system are regularly and frequently served by extension and benefit from that service.** One of the main problems of virtually all extension services in the traditional sense is that they have intense contact with a small number of farmers and no contact whatsoever with a large majority of the farmers. When a farming population is fairly homogeneous and good possibilities for diffusion exist, such a progressive farmer strategy does not need to be a problem.

It can even become advantage. However, when progressive farmers have relatively higher access to resources than others and become an exclusive target category for extension which monopolizes extension as a resource, the efforts can cause national problems. In Sri Lanka, such a problem existed and was recognized. The T&V system was adopted partly to improve extension coverage by providing appropriate extension services to a wider clientele. The T&V system seeks to make coverage more systematic, benefiting a large proportion of the farmers. Many empirical studies have demonstrated T&V's positive impact on total production or average yield, but there is no reason why these aspects should receive more attention than coverage. Chapter 7 provides a detailed conceptual framework on extension coverage. Chapter 9 provides some empirical findings. The hypotheses associated with coverage are:

1. Imperfections exist with respect to extension coverage.
2. Contact farmers tend to adopt innovations earlier than others.
3. Innovative farmers have more contact with extension.
4. Farmers can be clustered on the basis of their access to resources. Such clusters can be regarded as target categories.
5. Innovations are mostly adopted by the farmers who have a relatively high access to resources.

1.5 The second scientific objective: Information flow

The T&V system attempts to organize extension so as to utilize serial communication to facilitate information flow. For instance, starting the chain from the research station, the message is delivered through the Subject Matter Officer (SMO), the Village Extension Worker (VEW) who is locally known as Krushikarma Viyapthi Sevaka (KVS), the Contact Farmer (CF) in the hope of finally reaching the mass of ultimate users — the Follower Farmers (FFs). In fact, the bureaucratic set-up of traditional extension organizations usually provided a bedding to facilitate such serial communication. However, arranging the components of the communication chain more precisely and further, emphasizing systematic and regular contacts between components of the chain, the T&V system makes an effort to improve the efficiency of the information flow. Some recent studies (Hindori and Renselaar: 1982, Pandey and Mathur: 1983, von Blanckenburg: 1982b, Sivayoganathan: 1985) have provided useful insights concerning the information flow under the T&V management system and have illustrated certain deficiencies in the process. A detailed description of these studies and other conceptual issues will be provided in chapter 8. However, many unclarified aspects remain. Hence, the second objective of this study is to investigate the knowledge flow of the T&V system. Chapter 10 will provide the empirical evidence. The associated hypotheses are as follows:

1. Research-based messages reach CFs but not FFs.

2. At each level, information distortion occurs. Distortion accumulates during serial communication leading to severe knowledge gaps.

1.6 The third objective: Contributions of the study

1.6.1 Contribution to empirical research

Although only a decade has passed since its introduction, many criticisms have been levelled at the T&V system. Most of the arguments have not been based on empirical evidence. Lack of knowledge exists in many areas and, therefore, conclusions cannot be made on how T&V system really works in the field.

As described earlier, the T&V system gains ground in developing countries and considerable amounts of funds are spent by foreign donors, as well as by local counterparts. As an example, the Sri Lankan AEARP, which basically rests on the T&V strategy, has a provision of US.$ 22.5 M equivalent for its implementation during the first five years (Abeywardena: 1984:51). The local and foreign contributions were estimated to be US.$ 12.8 M and US.$ 9.7 M, respectively (Table 1.6.1). The total

Table 1.4: The cost breakdown of AEARP with local and foreign contributions.

Component	Cost (M US.$)			Percentage
	Local	Foreign	Total	
Extension	5.8	3.5	9.3	41.5
Adaptive research	1.3	0.9	2.2	9.8
Training	2.1	1.4	3.5	15.6
Monitoring and evaluation	0.2	0.2	0.4	1.8
Overseas training and technical assistance	–	1.6	1.6	7.2
Engineering and administration	0.1	0.2	0.3	1.3
Contingencies	3.3	1.9	5.2	22.8
Total	12.8	9.7	22.5	100.0
Contribution	57%	43%		

Source: Abeywardena:1984:51.

cost of the project can be further divided among the major elements, such as US.$ 5.4 M for buildings, US.$ 2.8 M for vehicles, US.$ 1.2 M for equipment and US.$ 4.2 M for salaries and allowances.

It is worthwhile to state that considerable attention has been paid to overcome one of the bottlenecks highlighted in the past extension system, the transport problem. Generally, the costs can be easily calculated, but benefits are difficult to attribute especially in extension projects. Therefore, in-depth research is warranted to evaluate performance. Insufficient knowledge about performance might bring bitter outcomes because spending will continue without reasonable benefits for a long time. In a nutshell, the international literature is still limited, even though the system is widespread. Hence, the third objective is to contribute to the international empirical research of the T&V system.

1.6.2 Extension training

A recent study shows that increasing numbers of students and researchers are interested in taking **Extension Science** as their academic specialization. The same study has suggested factors for increasing social relevance of extension science in the development process (Röling:1985). Training in Extension Education is an essential component which influences the effectiveness of extension organizations. In fact, assigning an official to an extension post is one thing which may be easily done but finding a trained person or providing an adequate training is a quite different and difficult thing. Collinson (1987b), in the lectures he delivered at the Agricultural University of Wageningen, stated that technically oriented education has produced technically minded agriculturists who are not conversant with approaches which look at the farm as a whole. Criticisms are levelled at universities and agricultural training institutions for not making necessary alterations in their curricula to take into account current developments in the field of agriculture.

Presently, in Sri Lanka, the agricultural training component is mainly being carried out by the following organizations.

1. Department of Agriculture
   Agricultural background training for village-level extension workers and to the middle-level extension workers is provided through Practical Farm Schools and Schools of Agriculture. Further, in-service training for all levels is organized through the Department's Regional Training Centers (RTCs) and District Training Centers (DTCs).

2. Universities
   Faculties of Agriculture in the universities produce agricultural graduates. The curricula have been developed to cover the subject matter in all fields in agriculture. Post-graduate training is also available. In-service courses are not organized by the universities although they account for a higher share of specialized personnel in the field of agriculture.

3. Private organizations
   A few private organizations provide agricultural courses leading to

scientific certificates, ad-hoc training and consultancy work.

It has been pointed out that the agricultural sector requires a substantial number of officials for extension. Unfortunately, most of the agricultural training curricula pay little attention to extension education. As an example, the university undergraduate curriculum includes a course which approximates 100 contact hours. This represents only 4 per cent of the total contact hours. However, it has been observed that many of the graduates will find in careers as extension personnel.

Most of the in-service training is organized within the framework of available facilities by the Department of Agriculture. Its main aim is to upgrade the subject matter knowledge of the extension workers which is of paramount importance if they are to perform their job effectively, assuming that they have gained a sufficient background knowledge on extension strategies, concepts, fundamentals and other components of agricultural extension. Alas, in most instances, this is not the case. To perform extension work more productively, extension workers at all levels should obtain an adequate training in extension education. It has been pointed out that a new extension worker should be stationed with an experienced officer to gain practical knowledge (Allo and Schwass: 1982:17). This is certainly one of the alternatives to obtain practical experience. However, given the acute shortage of extension personnel, a new officer normally has to work on his own.

A recent Sri Lankan study has found that there is an expansion in demand for agricultural workers with practical skills and advanced research competencies (Hanson and Jogaratnam:1985). In fact, this is mainly due to the country's present emphasis on agriculture. Agricultural production is being increased continuously by expanding the cultivated area, especially in the dry zone. The Mahaweli irrigation project is a fine example. In a nutshell, expansion in the production of rice, sugar cane, subsidiary crops and livestock will require more trained manpower in agriculture.

With the introduction of the T&V system, the need for trained extension workers has increased. First, the number of farm families per ex-

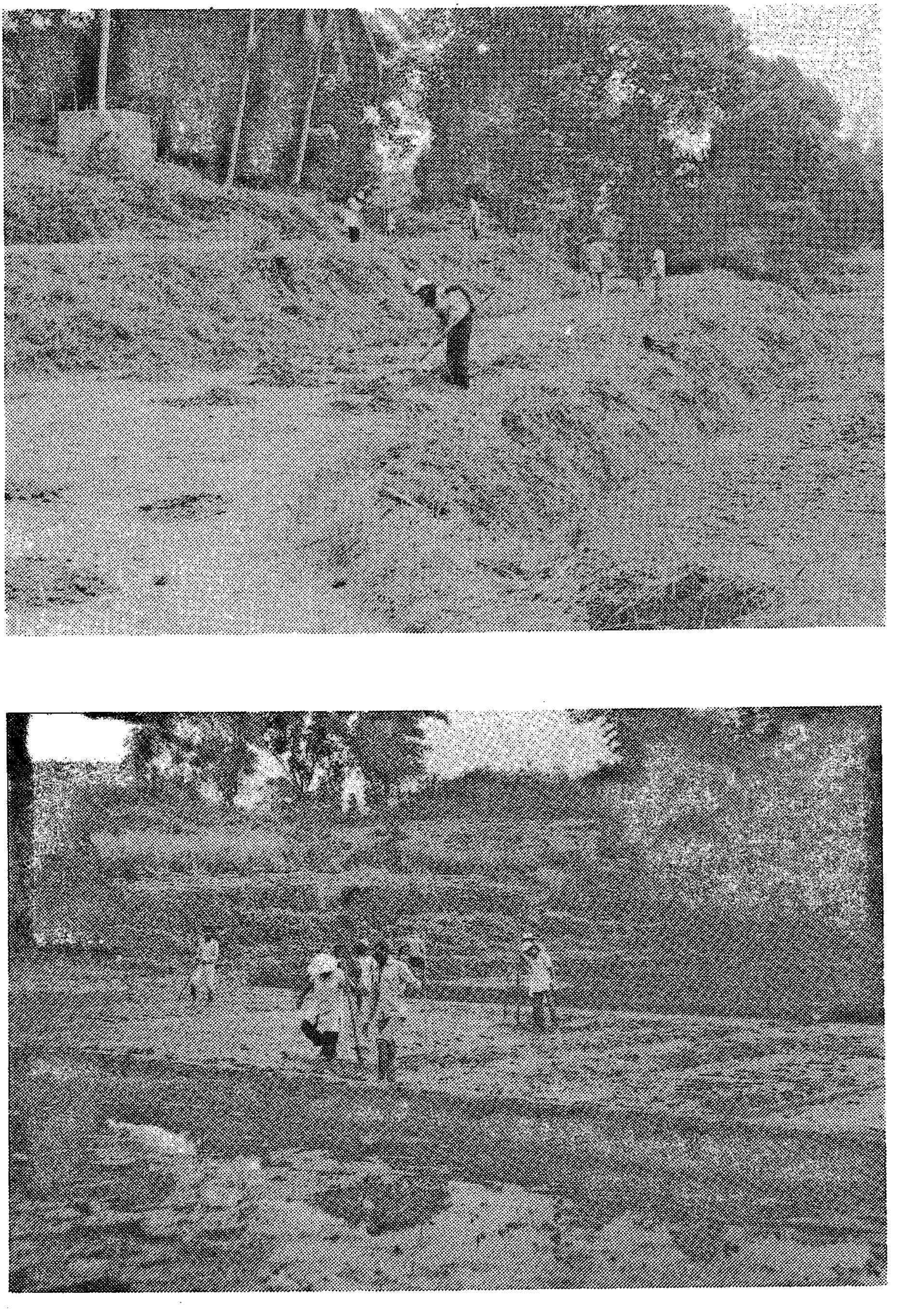


Figure 1.1: Manpower training in agriculture: Under-graduates doing practical work.

tension worker has been reduced. Second, the T&V system has created new specialized categories such as SMOs. Third, it emphasizes 'extension exclusiveness' (Benor et al: 1984:24). Therefore, we expect a more professional job from the extension organization. However, by focusing on technical problems, VEWs are not trained to render effective extension service (Russel: 1983:29) and SMOs are not specialized for their job and generally are new graduates without much experience (Pakdee: 1983:83). In fact, these two categories should receive special attention as they shoulder a considerable burden within the T&V re-orientation. A review on 'Training and Visit System of Agricultural Extension: Indian Experience' has indicated that most of the training of agricultural extension workers is theoretical and that not enough attention is paid to field training. Further, SMSs have received little training in their fields of specialization (van den Ban: 1988). Nateson (1983:55 af) has stressed the Sri Lankan training needs and explained the current attempts being made in this respect by the Department of Agriculture. Training of large numbers of extension agents in the required range of different capacities cannot be fulfilled by a single institution. Hence, national training institutions and state universities should share the responsibility (Galgali and Lindt: 1983:65). In essence, we should prepare more professionals for extension positions. In this respect, a worldwide realization has emerged and most of the international donor organizations pay priority to the training aspect of agricultural extension. Many of the aspects of training for the T&V system were discussed at the Asian Regional Workshop on the T&V System of Extension held at Chiang Mai (Cernea et al: 1983). The question arises whether we could provide reasonable extension training, given the sufficient financial support.

Today, we only use internationally developed manuals and text books without much concern for local conditions. The establishment of the **University of Ruhuna** in the Southern Province of Sri Lanka in 1978 made provision for the second Faculty of Agriculture. Since then, it has become a major agricultural institution in the province. Presently, there are three Agricultural Faculties in the country. With respect to agricultural extension, these faculties should serve as training centers for both agricultural officials and farmers. Further, they can function as research and dissemination components of an Agricultural Knowledge System (AKS). This study has been carried out in the surrounding farming communities of the University of Ruhuna. It therefore provides local training material for agricultural training programmes. Hopefully, this is a valuable contribution also for surrounding regions.

1.6.3 Contribution to the body of knowledge

Agricultural extension has been introduced only in the 19th century (Maunder: 1972:01). In fact, it has been neglected to a great extent up to the recent past, especially in developing countries. This is one of the major reasons why many developing countries have a well developed research sector in contrast to a weak extension set-up. Now it has been realized that even an excellent research sector will contribute little to agricultural development without an effective extension organization. Therefore, efforts are now being made to improve the impact of extension systems. But to formulate desirable strategies we still lack adequate knowledge in the area of rural extension. Almost in all countries we find extension practitioners, but there are few extension scientists. In other words, extension is left with a limited number of scientists and large a number of practitioners. This implies that extension theory is underdeveloped and hence, the army of extension practitioners is insufficiently supported to improve their professionalism (Röling:1988a). The field of medicine provides a fine example of a more optimal situation. On one hand, there is a set of medical scientists who advance the body of knowledge in medicine through undertaking research. On other hand, another set makes practical application of the body of knowledge improving health conditions and feeding back their experience to research (see Fig. 1.6.2). Research as well as extension have been criticized for developing and transferring of inappropriate innovations. This is mainly due to insufficient understanding of the different conditions existing among and between communities. The research sector should attempt to solve farmers' actual problems. Extension has a key role here — to identify farmers' pressing problems and to convey them to research scientists. But in most instances, this task is not performed well. Usually, the Transfer of Technology (ToT) model is applied to develop technologies without much concern for feedback and for information about the utilizers for whom the technologies are introduced.

Extension approaches, in particular, progressive farmer strategies which

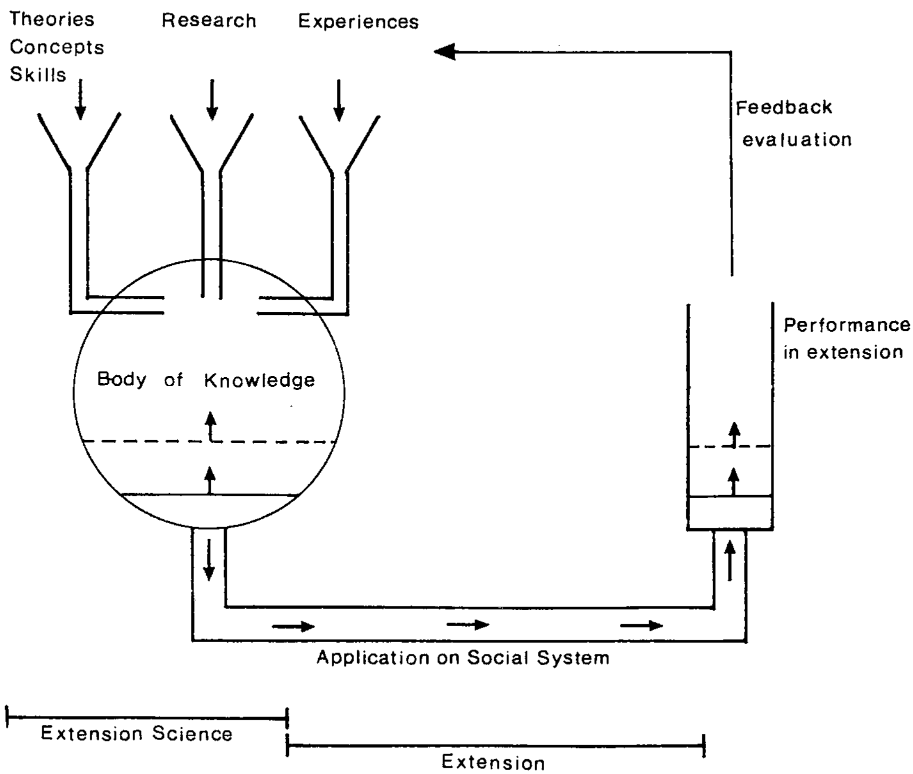


Figure 1.2: Body of knowledge contributes to practical extension and vice versa.

deal with a limited number of well-off farmers, have not been helpful in ensuring a wide dissemination of knowledge. Hence, we urgently need alternative strategies. To develop them, it is essential to strengthen the body of knowledge concerning agricultural extension. This means more research has to be done in this field to fill the gaps. Therefore, the final objective is to contribute to the body of knowledge through empirical research. Extension has not benefited much from systematic research. This is why extension has often failed to perform its tasks and, moreover, has been subjected to criticism. Hence, as mentioned earlier, research is a must in the field of extension in view of overcoming such drawbacks.

Part II

DESCRIPTION OF THE SITUATION

Chapter 2

MATARA DISTRICT

2.1 Physical setting

Matara district is located in the Southern Province of Sri Lanka and lies between 6° and 7° N latitudes and 80° and 81° E longitudes. The district has the deep blue sea as its southern boundary and the famous Sinharaja forest at the northern end. Galle and Hambantota districts are at its western and eastern boundaries. The entire Matara district covers 494 sq. miles (1282 sq.km). The district's elevation increases from the sea level in the south up to 3600 ft (1200 m) above sea level in the north. The area in the district can be classified into four physiographic regions. The coastal plain in the southern end of the district mainly consists of lowland parts which are below sea level. Next, towards the north is the mantle plain where undulating or rolling topography is found. Its elevation is about 166 ft (50 m). The highland plain follows at an elevation between 166 ft (50 m) to 1000 ft (300 m). The mountainous region in the northern part of the district starts at an elevation of 1000 ft (300 m) and rises up to 3300 ft (1000 m).

2.1.1 Agro-ecological zones

According to the agro-ecological map which was compiled by the Department of Agriculture (1976), Matara district consists of three agro-ecological zones. They are classified as follows:

1. Coastal zone WL_4
2. Central WL_2
3. Northern zone WL_1 and WM_1

The coastal belt comes under WL_4 and the topography is generally characterised by flat terrain. The central part of the district belongs to agro-ecological zone WL_2 and the terrain is rolling and undulating. The northern part falls in WL_1 and WM_1. The landscape is characterised by hilly highlands and mountains. In 75 per cent of the years the Northern agro-ecological zone experiences a 1 1/2 month period of drought, while there are 2 and 2 1/2 months respectively in the zones WL_2 and WL_4 (ARTI:1981:14). The major part of the district falls into the low country wet zone. The district is characterised by relatively high temperatures and and has a tropical climate. The mean annual temperature ranges from 24 degrees Centigrade (75 degrees Fahrenheit) to 27 degrees Centigrade (81 degrees Fahrenheit) and the relative humidity is generally constant throughout the year, approximates 70 per cent inland and 80 per cent on the coast. Figs. 2.1.2 and 2.1.2 show the location of the Matara district — the study area and the agro-ecological zones, respectively.

2.1.2 Precipitation

Matara district has a fairly balanced rainfall distribution throughout the year. In fact, the district benefits from both main monsoon rains. The north-east monsoon normally occurs from September to February which corresponds to the cultivation season termed **Maha**. the south-west monsoon starts in March and ends in August and this cultivation season is known as **Yala**. However, the rainfall varies with the topography ranging from an average of 100 inches (2500 mm) per annum along the coast to more than 200 inches (5000 mm) per annum in the mountain upper catchment areas of the district. Rice cultivation greatly depends on the rainfall distribution pattern during these two cultivation seasons. Generally, cultivation starts with the onset of the monsoonal rains. The local rice growers make some assumptions about the start of their cultivation. For an example, the optimum date for plant establishment for the Yala season is considered to be 15 - 30th March. However, to carry out land preparation practices, it is essential to have approximately 5 inches (125 mm) to 6 inches (150 mm) of rainfall within two weeks prior to the land preparation practices.

2.1.3 Soils

The major part of the district is occupied by Red-yellow podzolic soils. These soils are generally deep and well-drained. They are extensively leached and have poor natural fertility. They are stable but intensive soil conservation practices should be applied in order to prevent erosion, especially where rainfall is high. These soils are very common in highland plains. Minor soil groups such as bog soils and half bog soils occur in the coastal plain in places, such as backswamps of flood plains and in adjoining lagoons. Bog soils cannot support men, animals or machinery, even at low field moisture levels, and this has become a major limitation to intensive paddy cultivation (ARTI:1982:13). Humic alluvial and humic gley soils occur in the flood plains. Moreover, low humic alluvial gley soils and regosols are also found in some places in badly-drained areas. The problem of iron toxicity has been reported but it has not become a major limitation. Moreover, in coastal lowlands, salinity has limited agriculture. Recently, priority has been granted to salinity and flood control. Ground water levels vary from 3 ft (1 m) - 9 ft (3 m) in well-drained locations to 4.5 ft (1.5 m) - 6 ft (2 m) in ill-drained locations.

2.1.4 Hydrology

The river Nilwala flows in a north-south direction and a major part of the district lies within the catchment area of the river. The river forms small valleys. The hydrology of the flood plain is governed by the flow of the river. During heavy rainfall periods the flood plain is subjected to high ground-water tables and flooding. In recent years, it has been observed that floods have been more frequent due to the indiscriminate land clearing in the upper catchment areas which results in high run-off from these areas (ARTI: 1981:03). Valleys of the mantle plain receive run-off water during rainfall periods and sometimes flash

Figure 2.1: Matara district : the study area

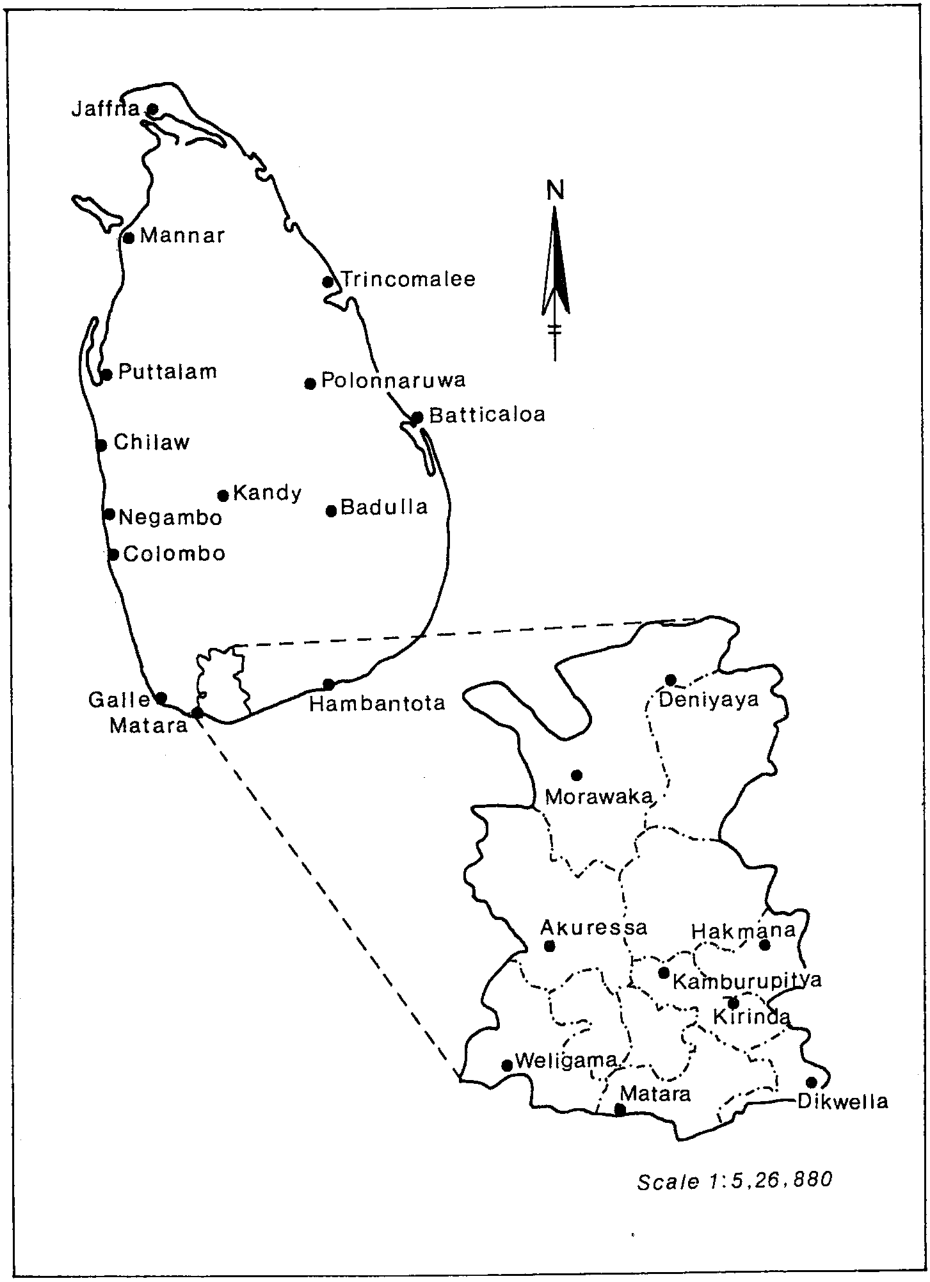
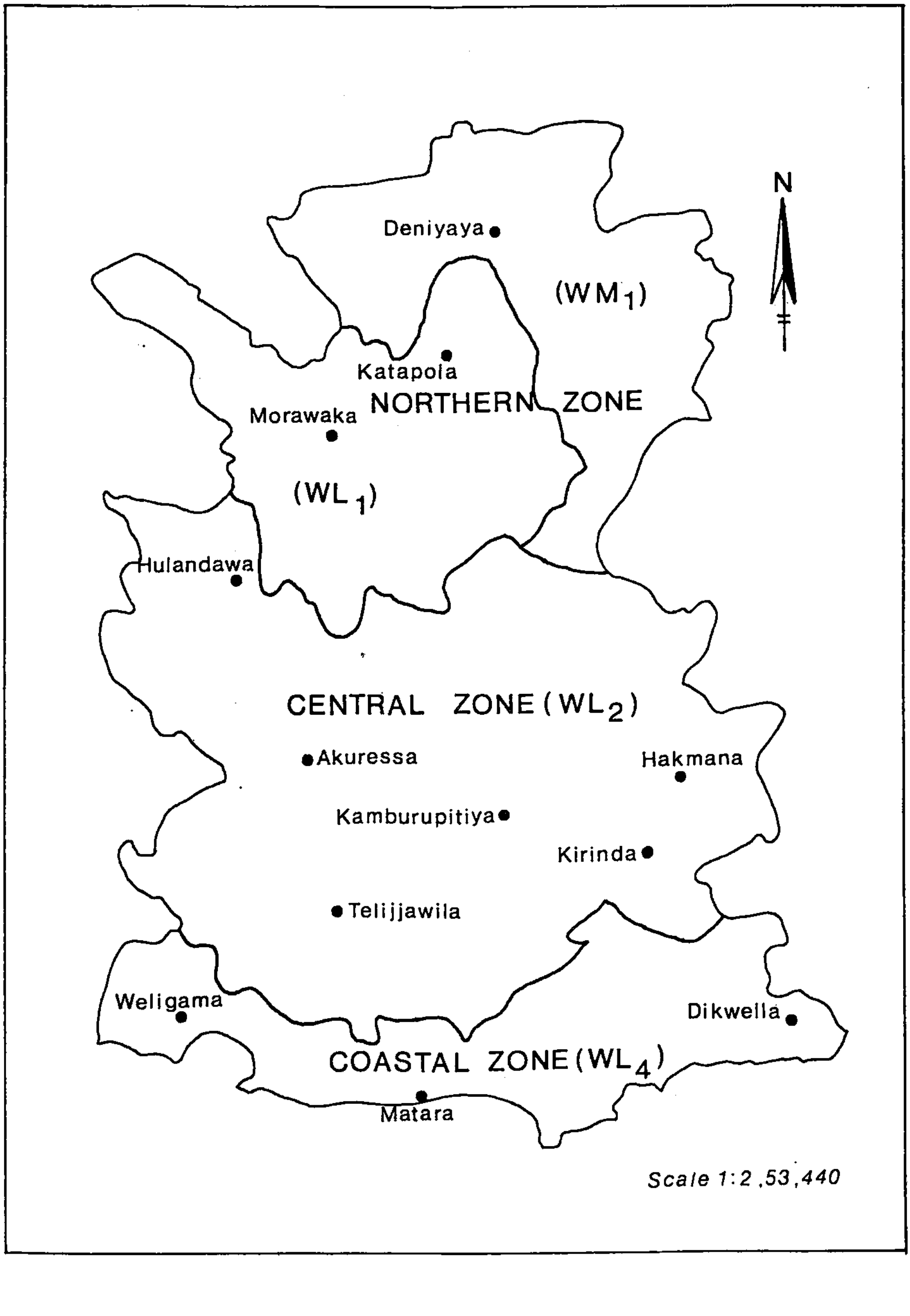


Figure 2.2: Agro-ecological zones



floods occur. Moreover, subsequent to rainfalls, seepage water from hills develops excess water conditions. It is evident that the frequent floodings and run-off water have caused a severe nutritional imbalance in the rice area. However, during the recent years, flood protection programmes have received great attention from the government authorities and among them the Nilwala Ganga flood protection scheme is a prominent element. However, there is a considerable doubt with respect to its economic feasibility as the project has a very poor internal rate of return.

2.2 Population

The population of the district was estimated to be as 644,231 persons in 1981 (Department of Census and Statistics: 1982c:24) and the annual rate of population growth is approximately 1.0 per cent over the period 1971-81 (Department of Census and Statistics: 1981:xiii). It has been estimated that the 1984 mid-year population in the district is 690,000 inhabitants (Central Bank:1985b:06). Further, statistics show that in 1981, urban and rural inhabitants in the district numbered 71,500 and 572,700, respectively (Central Bank: 1985b:07). Table 2.2 shows the percentage distribution of the population in Matara district according to the agro-ecological zones and between urban and rural sectors in 1981 (ARTI: 1982:18). It has to be noted that, in the above statistics, all municipal, urban and town council areas were regarded as urban sector and the rest of the areas, including estates, comprise the rural sector.

Table 2.2 shows the relative importance of the rural sector. During the period from 1971 to 1981, significant changes have been taken place in urban-rural migration (ARTI: 1982:18). The population density was 564 inhabitants per sq.km in 1981 (Department of Census and Statistics: 1982c:29). A significant variation in population density between three agro-ecological zones has been observed. The coastal, central and northern zones have 1206, 429, and 271 inhabitants per sq.km respectively in 1980 (ARTI: 1982:23). The literacy rate of people of age ten years and older was 85.1 per cent (Government Agent's Office: 1984:12), while the national figure was 86.5 per cent in 1981 (Department of Census and Statistics:1982c:34). The pupil-teacher ratio for the district and Sri Lanka were 23.7 and 25.6 respectively, in 1981 (Department of Census

Table 2.1: The percentage distribution of the population in Matara district according to the agro-ecological zones and between urban and rural sectors, 1982.

Zone	Rural sector	Urban sector	Total
Coastal (WL_4)	29.0	10.0	39.0
Central (WL_2)	39.0	01.0	40.0
Northern (WL_1 + WM_1)	21.0	-	21.0
Total District	89.0	11.0	100.0

Source : ARTI: 1982:18.

and Statistics: 1982c:327). The predominant ethnic group in the district is Sinhalese. They represent 94 per cent of the population. Indian Tamils, descendants from the South Indian labour force, imported during the British rule for the work on plantations, constitute 2.2 per cent of the population. They mainly live on the estates. Further, there are 2.5 per cent Moors, 0.6 per cent Sri Lankan Tamils and 0.03 per cent Burghers (Department of Census and Statistics: 1982c:31).

2.3 Administration

2.3.1 Some ancient history

The historic city of Matara was referred to as Matota, Mahatota and Matara. Historians agree that the name means 'large boat station' referring to the ferries crossing the famous river Nilwala. According to various ancient records, Matara region comprised of two segments known as the Dahas Koralaya and Weligama Dahas Gama. Further, the history of Matara can be traced back to Naga era. Prince Mahanama who fled to Ruhunu (ancient southern region), is reputed to be the first descendant of the Naga tribe who migrated to the southern part of the country. The power and influence of Nagas was evident till 300 A.D. and faded away thereafter. However, names of the places still in existence such as

Navimana, Nadugala, Naimbala, Naotunna, Nakanda etc. were created during this period.

2.3.2 Foreign rule

Matara Region suffered from the invasion by European nations. The Portuguese were the first to arrive accidentally in 1505, having been driven by the 'Vagaries of wind and wave'. They were soon attracted by the prospects of the lucrative trade in spices, especially cinnamon, for which the island enjoyed a great reputation at that time. Before long the Portuguese had conquered a major part of the maritime province. They were the first to introduce Christianity to Sri Lanka. In 1594 the Sinhalese king who ruled with Portuguese assistance gifted his kingdom to the invaders through a deed. This ended the Sinhalese royality in the region and Matara came under Portuguese domination. In 1595 the Matara Fort was constructed. The interior of the country — the kingdom of Kandy or Sinhala, continued to be ruled by the kings, according to the old laws and customs of the Sinhala Buddhist people.

The Portuguese were ousted by another naval power, the Dutch, in 1640. In fact, invading Portuguese and Dutch fought for supremacy until the coastal belt fell into the hands of Dutch. The Dutch Fort constructed in Matara is presently known as the Star Fort. From a demographic point of view, it is worth noting that, as a result of the Dutch occupation, a group of Sri Lankans of European descent, known as 'Burghers' came to be established in Sri Lanka. The small community of Malays on the island are descendants of Javanese who were brought to the island by the Dutch for military service and canal building. Matara became the location of a series of battles between the Sinhalese and the invading Portuguese and Dutch. It is gratifying to note that Matara and its people were in the fore-front in the struggles against invaders and formed the vanguard of the resistance movement.

In 1796, the British took over the maritime provinces from the Dutch. The Kandian Kingdom which had withstood aggression from foreign powers for centuries finally fell to the British in 1815. The era of British rule witnessed far-reaching changes in the political, social and economic life of the people. Further, this marks a turning point in the administrative history of Sri Lanka. The development of tea and rubber plantations, the opening of roads and railways, the introduction of English, the creation of an elite native class beholden to the rulers and anxious to copy their life style, and the gradual erosion of indigenous culture, were the main highlights of the British rule in Sri Lanka (UN Fund for Population Activities:1980:04). The European invasion resulted in systematic destruction of national values, culture and religion and also cost the national sovereignty and independence. The British ruled the country through a Governor General responsible to the monarch of the British Empire. In 1931 the State Council was formed and Matara was allocated three seats.

2.3.3 Post-independence period

Sri Lanka became free in 1948 with the implementation of the Parliamentary system and Matara was allocated five elected parliamentary representatives. In 1960 the number of parliamentary representatives for Matara was further increased to seven. Sri Lanka achieved the status of independent Republic in 1972 by a new constitution and the Senate which was introduced in 1948 was abolished by the same act. In 1978, another constitution was introduced which provides for an elected National Assembly (Parliament) on the basis of proportional representation. An Executive President is elected directly by the people for a six year period and he appoints the Prime Minister. The concept of peoples' participation was enhanced with the District Development Councils (DDCs) in 1980.

2.3.4 District administration

The Sri Lankan provincial administration system is referred to as the Kachcheri system. Each district has its administrative complex and, in Matara district, the Kachcheri is located inside the Portuguese Fort. This system was introduced by the Dutch authorities in the late 18th century and extended all over the island by the British authorities in the 19th century (Strom: 1979:35). According to the present administrative system, the district is headed by the Government Agent (GA) and divided into 12 Assistant Government Agent (AGA) divisions. Further, each assistant Government Agent division is sub-divided into 15 - 25 Grama Sevaka (GS) divisions which are the village level segments of this hierarchical system. In Matara district, the Government agent is served by three Additional Government Agents (Add. GAs) responsible for development, lands and administration.

The district consists of seven parliamentary electorates and each of them is represented by a member of a political party. From the beginning of this decade, the District Development Councils, Pradeshiya Mandala (PM) and Gramodaya Mandala (GM) came into operation under the Development Councils Act No.35 of 1980 and Development Councils (Amendment) Act No.45 of 1981 (van Dusseldorp :1985:18). These three administrative bodies function at the district level, Assistant Government Agent level and Grama Sevaka level respectively. Matara district has 643 voluntary organizations, 225 Gramodaya Mandala, 12 Pradeshiya Mandala and one District Development Council. However, it has been observed that through these new institutions, the political representatives of the district have taken control of district administration (van Dusseldorp: 1985:25). Even though the new system started in a dynamic form, results were not as significant as expected.

2.4 Industries

Presently, Matara district has a limited industrial base which accounts for only about 4 per cent of paid employment. Most of the industries are on a small scale and are predominantly of a consumer-good type. The capacity of existing industries to generate forward and backward linkages is generally lacking (Ministry of Plan Implementation:—:14). Further, the primary production in the district cannot give rise to a broad industrial sector. The organization for basic processing of tea, rubber and cinnamon already exists although the capacity is often inadequate. It is possible that some of the subsidiary crops and livestock can offer some potential for food processing. In addition, an expansion in fisheries could provide the raw materials for fish meal production, dry fish production and maldive fish manufacturing.

Coconut gives rise to a number of small industries such as copra making, coconut oil extraction, soap making and coir making, specially in the coastal belt. The most prominent one among them is the coir industry which produces coir ropes, coir yarn, mattresses, carpets etc. Most of these coconut-based industries can be regarded as cottage industries, but there are few privately-owned factories too. Pottery is another important small-scale industry in the district. All necessary inputs for the industry such as clay and coconut husk are found locally. There is a little likelihood that the district can provide sufficient attraction for large scale industries to settle. Therefore, new industries are likely to continue to be of small scale and of consumer-oriented type (Ministry of Plan Implementation:— :14).

2.5 Fisheries and Livestock

2.5.1 Fisheries

Around 15,000 people are engaged in fishing. The fishing families occupy the coastal boundary of the district which is 45 km. in length and covers three electorates namely Weligama, Matara and Dondra. Weligama, Mirissa and Dondra are the main fishing centers and most of the fishing villages are concentrated around these points. Generally, the fishing population falls into the low income group. During the last two decades, the introduction of new technologies, such as powered crafts, 3 1/2 ton boats, nylon nets etc. accompanied by high prices obtained for special seafood varieties, such as prawns and lobsters, has generated additional incomes in the fisheries sector, but these benefits are mostly unevenly distributed between boat owners and paid workers (Wijeratne: 1982:43).

Fishermen in Matara district can be divided into two main categories, according to their method of fishing. Some engage in deep sea fishing close to the coast. The deep sea fishermen use traditional or mechanised boats or trawlers and, nets or fishing rods. The shallow sea fishing is done mainly with large fishing nets called 'Madel' and individually by fishing rods. In lagoons, prawns, lobsters and crabs are harvested. Normally, fishing is carried out in the district throughout the year. During the south-west monsoon period, which ranges from March to August, conditions are not favourable for deep sea fishing by traditional crafts, but presently, with mechanized boats, fishing can be done during the rough sea period. However, the ideal fishing period commences in October and ends in February. Most of the fish caught by deep sea as well as shallow sea fishing is sold by the fish auctions. Wholesale prices are usually very low and often insufficient to cover the cost of production. The major part of the district's fish production is sent to Colombo by the wholesalers. Fishing equipment has become a major constraint in the district. Statistics show that only few fishermen own boats and other fishing equipment. In every fishing village, boat owners are found and fishermen have to hire their boats and other relevant equipment. In other words, fishermen have to pay the hiring charges to non-productive boat owners on a share basis which is relatively high. The district has no cold room facilities and therefore, fish storage and processing have become limitations too.

2.5.2 Livestock

Animal production has received little attention in Matara district and it is regarded as an insignificant agricultural activity. However, the traditional curd industry has given a remarkable identity to the area. Curd production has long been practised as a home industry. The small-scale milk producers transform their excess raw milk into a preserved form utilizing a simple bacterial process. A major constraint for the development of dairying is the price of milk. Further, fresh milk marketing has become a bottleneck too. It has been pointed out that a potential exists to develop animal husbandry in the district, especially in the northern agro-ecological zone where the environmental factors are favourable for milk production. However, despite some recent effort, the existing institutional framework and economic conditions are inadequate to promote animal husbandry in the district for the time being. It has been revealed that there is an extreme scarcity of high grade stock and semen for artificial insemination (Ministry of Plan Implementation:–). However, the Matara branch of the Department of Animal Production and Health and, the Integrated Rural Development Programme in Matara, have made some efforts to develop the animal production sector by issuing breeding stock of poultry, cattle, goats and pigs and planting materials for pasture improvement. Further, they have rendered services such as artificial insemination, vaccination, pregnancy inspection, training and extension (Department of Animal Production and Health: 1982:1-7).

Chapter 3

AGRICULTURE AND SMALL SCALE FARMERS

3.1 Agriculture

3.1.1 Share in the economy

As stated earlier, the agriculture sector has been the mainstay of the country's economy. The share of agriculture in GDP has remained fairly constant since 1971 at 26-27 per cent and the latest statistics indicate a figure of 27.7 per cent in 1986 (The Economist Intelligence Unit:1987-88:08). Further, agricultural employment too, has remained constant having a share of 50 per cent of total employment over the past decade. Agricultural export earnings have shown a considerable decline from 91 per cent in 1970 to 58 per cent in 1982 (Ministry of Finance and Planning: 1983:51). Recent statistics reveal a further decline to 52.5 per cent in 1985 (Central Bank: 1985a:120). This drop can be explained partly by the decrease in production and export prices of the three plantation crops, tea, rubber and coconut and partly by the increase in the value of industrial exports. It has been observed that the contribution to GDP from the plantation sector has decreased from 9.0 per cent in 1970 to 7.5 per cent in 1982 (Ministry of Finance and Planning:1983:83). However, this contribution has shown an increasing trend since 1982 and in 1985 it was 10.5 per cent. Despite the above changes, agriculture is still the main foreign exchange earner. Further, minor export crops has become significant in the export trade during the last decade.

3.1.2 Climatic zones

Topographically, the island has a crown of mountains rising to 7,000 to 8,000 feet in the south-central region, surrounded on all sides by fairly flat lowlands. In the south-east, south and west there is only a narrow strip of lowland between the highland and the coast but to the north, the lowland fans out into a large plain. Rivers flow down out from the highlands, following geological fault lines in the upper reaches. The highland and the southwestern parts of the country which constitute about 25 per cent of the area receive 70 inches (1750 mm) to 200 inches (5000 mm) of annual rainfall and are referred to as the wet zone. The remaining 75 per cent of the island, comprising the lowland to the north and to the east, receives only 35 inches (875 mm) to 75 inches (1875 mm) of annual rainfall and belongs to the dry zone. A narrow strip of land fringing the highlands to the north and east of the highland is regarded as the intermediate zone.

3.1.3 Plantation crops

The export earnings of Sri Lanka depend on the performance of the three plantation crops, tea, rubber and coconut. As mentioned earlier, the growth of this sector has been rather disappointing in the past decade, but it still plays an important role in the overall economy. However, in 1985, tea production has increased by 3 per cent over the previous year. This increase of 6.1 M.kg was mainly due to the combined effect of favourable weather conditions and increased fertilizer applications (Central Bank: 1985a:22). The production trend in the rubber industry, after a vigorous drawback in early years has been equally disappointing in recent time. It has to be mentioned that during the period 1950-60, large acreages were taken out of tapping as a result of the Rubber Replanting Subsidy Scheme which was implemented in 1953. Coconut production has showed a steady decline since 1970, except in 1972. Among the factors which contributed for this decline are the dwindling area under coconut, inadequate replanting, low fertilizer application and unfavourable weather conditions.

3.1.4 Minor export crops

All exportable agricultural products other than plantation crops have been classified as minor export crops. They comprise cocoa, coffee, cashews, pepper, cloves, cardamom, sesame seeds, other spices, medicinal plants and herbs. The production of most minor export crops except cocoa, coffee, cardamom and sesame seeds, fell during 1985. The production of sesame seeds increased more than three-fold while cocoa and cardamom production almost doubled. Coffee production rose by about 43 per cent. Minor export crops are grown as mixed crops, mainly on home gardens. Hence, data on the acreage under cultivation are scanty. As a result, a direct assessment of this sector's performance is not possible. Therefore, changes in export volume are used as a proxy to ascertain the movements in production since a very large proportion of these products is exported.

3.1.5 Paddy sub-sector

The largest component of field crop production is rice cultivation. This staple crop occupies about 1.7 M. acres (0.7 M ha), equally distributed between the wet, intermediate and dry zones. In the wet zone 60 per cent of the paddy is found in lowlands. About 25 per cent is grown in the midlands and the remainder in the highlands. In the dry zone it is the principal crop and is grown wherever there is adequate water to obtain a reasonable yield. In total, the wet zone districts approximate a 25 per cent share of the island's paddy growing area but contribute only 20 per cent to the national rice production. This indicates that efforts to improve rice production should also be focused on the populated areas where the number of farm families per unit area is relatively higher than that of the dry zone (Jayawardena and Peris: 1980:33). Rice production has shown a steady increase from 1.25 M.mt in 1976 to 2.4 M.mt in 1985. This doubling of total production is mainly due to increase in average yield per acre and expansion of cultivable extent in dry zone irrigation projects.

Table 3.1: Acreage of principal crops in Sri Lanka in 1984.

Crop	Acreage	Per cent area
Rice (Maha 83/84)	1,497,909	37.5
Coconut	1,028,565	25.7
Tea	562,849	14.1
Rubber	507,805	12.7
Manioc	140,296	3.5
Maize	81,263	2.0
Chillies	72,618	1.8
Kurakkan (finger millet)	41,743	1.1
Sweet potatoes	40,508	1.0
Potatoes	14,820	.4
Red onions	9,633	.2
Total	3,998,009	100.0

Source: Department of Census and Statistics:1986:64-65.

3.1.6 Other crops

A group of subsidiary food crops, such as onions, chillies, potatoes, maize, groundnuts, green gram, black gram, kurakkan (finger millet), manioc and sweet potatoes are grown in minor scale outside the wet zone area. A large part of the production of subsidiary crops comes from 'chena' cultivation, a form of shifting cultivation practised in the dry zone. In recent years, sugar cane cultivation has been intensified in the dry zone. Cotton is also cultivated in dry areas. Vegetables and fruits are grown in wet, intermediate and dry zones. Table 3.1.6 illustrates the acreage under principal crops in 1984. This reveals that among the principal crops grown in the country, as a percentage of land utilization, rice utilizes the largest proportion of the land cultivated.

3.2 Agriculture in Matara district

3.2.1 Overview

As in other wet zone districts, the agricultural sector in Matara district shows a typically dualistic structure with a relatively developed state-owned plantation sector and peasant or rural sector. Traditional export crops are prominent in the plantation sector. Paddy cultivation is distinct in the peasant sector. Minor export crops, such as cinnamon, pepper, coffee, citronella and cloves are grown on plantations and small holdings. Among the perennial crops grown in the district, tea and cinnamon are the ones which make a significant contribution to the national economy. Approximately 36 per cent of the active labour force (people of 10 or more years of age) in Matara district is employed in agriculture. It has been estimated that there are 96,944 farmers in the district and that the total area cultivated is 1,98,458 acres (79,383 ha). Table 3.2.1 shows the acreages under principal crops in Matara district in 1985. It reveals that rice is the major crop which accounts 30 per cent of the area under principal crops. Coconut, tea and rubber occupy 24, 24 and 13 per cent of the land respectively.

3.2.2 Plantation crops

The acreage under tea in the district ranks fifth largest in the country. Tea plantations are concentrated in the agro-ecological zones WM_1 and WL_1, but the present tea acreage in these two agro-ecological zones is about 2500 acres larger than the area recommended for tea. The tea area in the district has increased considerably over the past two decades. Present statistics show that, in 1985, the area under tea was 40,058 acres (16,032 ha). Clonal tea has gradually replaced the seedling tea and the area under clonal tea has increased from 15 per cent in 1970 to 38 per cent in 1979. The average tea yield in the district approximates 1000 kg/ha/year but there is a clear difference in average yields between clonal and seedling teas. A steady decline in average yields, particularly of seedling tea, has been observed. This is mainly due to the discouragement of investment created through nationalisation. However, the Tea Master Plan has estimated potential average yields of 2,000 kg/ha/year for seedling tea and 2400 kg/ha/year for clonal tea. Present production

Table 3.2: Acreages under principal crops in Matara District in 1985.

Crop	Acreage	Per cent
Rice (Maha 85/86)	50,289	29.6
Coconut	40,767	24.0
Tea	40,058	23.6
Rubber	21,123	12.5
Cinnamon	14,079	8.3
Cloves	988	.6
Coffee	815	.5
Pepper	642	.5
Citronella	580	.3
Cardamom	131	.1
Total	169,472	100.0

Source: 1. Central Bank:1985b:02.
2. Government Agent's Office:1985-86:02.

is about 17,800 tons per annum but the production potential has been estimated to be 45,000 tons per annum. The teas produced in this area are generally known as low country teas.

The rubber area in Matara distric has been rather constant over the past two decades. The area suitable for rubber is considerably higher than the present acreage. In 1985, the area under rubber was 21,123 acres (8,449 ha) which represents 5 per cent of the national rubber area. Cultivation is concentrated in the agro-ecological zone WL_2. It has been stated that there are lands in agro-ecological zones WL_2 and WL_4 which are suitable but not planted with this crop. The present district average approximates to 800 kg/ha dry rubber sheets per annum but the potential average has been estimated at 1,000-1,500 kg/ha. The annual production of the district approximates 8,000 tons of Ribbed Smoked Sheets (RSS) which contributes 5 per cent to national rubber production.

Coconut cultivation is concentrated in the agro-ecological zone WL_4. In 1985, the coconut acreage in the district was 40,767 acres (16,307 ha). Half of this area consisted of monoculture plantations, while the other half is under mixed cropping system with other perennial crops. Recently, attempts have been made to introduce cinnamon, coffee, pepper and cloves to the coconut cultivation as intercrops. The coconut acreage was rather constant over the last decade. The average yield in the district is around 3,600 nuts/ha/annum but large plantations obtain an average yield of 5,400 nuts/ha/annum. It has been demonstrated that in favourable soil and climatic conditions, specially in agro-ecological zones WL_4 and WL_2, yields of 9,000 - 15,000 nuts/ha/annum can be obtained. Even though, a significant proportion of the cultivated area, particularly at low elevations, is under coconut, the district is not regarded as a major coconut producing area. Due to strong local demand for fresh nuts and low levels of production, the district only contributes in a very minor way to the national export economy. The district production has been estimated at 63 M nuts a year, but there is a considerable potential for production improvement.

3.2.3 The paddy sub-sector

Rice is the only crop which occupies a significant land area in the peasant sector and the acreage cultivated during the Maha season 85-86 was 50,289 (20,116 ha). In fact, the central and coastal agro-ecological zones are prominent in rice culture, occupying 66 and 20 per cent of the area respectively. Approximately 62 per cent of the rice cultivation is still rainfed and it has been observed that shortages of water cause crop damage in the agro-ecological zones WL_2 and WL_4. In the northern agro-ecological zone, the rainfall pattern is quite favourable for rice and therefore, irrigation facilities are not required. As floods are very frequent in the district, rice cultivation is often affected by them. It has been observed that 73 per cent of the land area sown in both growing seasons during the decade 1969-79 had been subjected to flood damage. Therefore, crop failures caused by floods are significantly higher than those caused by water shortage which has been estimated to be 10 per cent for the same reference period. Approximately 76 per cent out of the rice land is subjected to flooding in the main rice growing zone, WL_2.

Although rice cultivation has occupied a large area, adverse weather conditions have made Matara a poor rice growing district. The average yields are the lowest on the island. In the 1985 Yala season, Matara district reported an average paddy yield of 48 bu/ac (2,496 kg/ha) while the national average for the same season was 64 bu/ac (3,328 kg/ha). However, the Agricultural Implementation Programme has estimated an average paddy yield of 60 bu/ac (3,120 kg/ha) for the 85-86 Maha season (Government Agent's Office: 85-86:03). The annual production in the district has shown only a marginal increase over the past period. The district has recorded a paddy production of 32,527 mt in the Yala season 1985. New plant establishment methods such as transplanting and row seeding have been introduced some two decades back but still these innovations have not penetrated to practice. Statistics show that, in Maha season 85-86, the acreage broadcast, transplanted and row seeded in Matara district were 80, 15 and 5 per cent of the cultivated area respectively (Government Agent's Office:85-86:10). This indicates that only 20 per cent of the rice cultivation is under improved plant establishment methods. However, during the past decade, the area transplanted has gradually increased while the area broadcast has been slightly declined.

The trend in plant establishment methods in Matara district exhibit similar patterns as national trends, but these improved methods have diffused less in the district compared to the national average. This is partly due to the higher risks associated with floods and water shortages.

High Yielding Varieties (HYVs) have become very popular among rice farmers since their introduction. In Matara district too, traditional and old improved rice varieties were replaced by the new improved HYVs. Statistics show that new improved HYVs represent 85 per cent of the rice acreage in the district. However, in the country,the proportion of HYVs has remained around 70-80 per cent of the rice area for the last 5-6 years (Panabokke:1980:03). Matara exhibits a similar pattern. Among the rest of the innovations which were introduced during the past decades, chemical fertilizer applications and chemical control of weeds, pests and diseases have widely diffused in the district. Chemical fertilizers are applied to almost all land under HYVs. Further, chemical weed control and pests and disease control measures are applied to 75 and 50 per cent of the rice cultivated area, respectively. However, it is important to state that even though a high percentage of the area under rice is treated with these chemical innovations, they were not applied in correct quantities, sequence, frequencies, timing etc. This implies imperfections in the knowledge dissemination process to which I shall return later. Generally, harvesting is done by sickle and female labourers are used in this operation. Threshing is done by men or with buffaloes. In recent years, a simple thresher which can be operated with a two-wheeled tractor engine has become popular among rice farmers in the district. Winnowing is increasingly done with simple machines such as hand-operated fans and two-wheeled tractor operated fans, instead of hand winnowing. The small scale rice mills convert paddy into husked rice. The milling percentage is around 60-65 due to unimproved equipment and inadequate maintenance in rice mills.

3.2.4 Other crops

Among the minor export crops grown in the district, cinnamon comes first in acreage. In 1985, the area under cinnamon was 14,079 acres (5,632 ha). This accounts for 40 per cent of the cinnamon acreage in the country but provides only 25 per cent to the national production

Figure 3.1: Mixed cropping of minor export crops and other crops

(ARTI:1982:03). In recent years, an emphasis has been made to intensify the cultivations of minor export crops such as cloves, coffee, pepper and cardamom. These crops are grown as intercrops, mainly under coconut and in home gardens. Vegetables and fruits are also cultivated in similar cropping systems.

3.3 Farming systems

3.3.1 The three-fold pattern of land use

The farming system in the peasant sector shows a three-fold pattern of land use. The first component of this land use pattern is cultivation of valley bottoms which is referred to as 'lowland'. In most instances, rice is cultivated in these lowlands. In fact, water-logged conditions which prevail in valley bottoms are ecologically suitable for rice culture. The second component of the land use pattern is referred to as 'highland' cultivation. Generally, highland is hilly land. The highland is further divided into a 'home garden' which forms the third component of the land use pattern and consists of dwelling and mixed crops. These three physically separated components are found in the typical land use pattern. The rural sector of the Matara district exhibits more or less the land use pattern explained above. Paddy is cultivated in lowland. The home garden is characterized by mixed cropping and the highland is occupied by a monocrop, mostly tea, rubber or coconut, or with minor export crops, which are generally cultivated as mixed crops.

3.3.2 Farm type

Within the small farm sector, seven types of farms can be identified (Herath et al: 1980:13). These seven physical farm types can be described under three major categories as follows.

1. **Three component farms**
   Farms which have lowland, home garden and highland. Here the three components of the land use pattern are combined in a single farm.

2. **Two component farms**
   Out of the three components of the three-fold land use pattern, two components were combined in a single farm.

   - Lowland combined with highland
   - Lowland combined with homegarden
   - Highland combined with homegarden

3. **Single component farms**
   Single land component of the three-fold land use pattern is consisted in single farms.

   - Lowland only
   - Highland only
   - Homegarden only

In 1980, the traditional three component farm type covered 36 per cent of the cultivated land and 16 per cent of the farms in the small farm sector of the country. Further, the three and two component farm types together represented 80 per cent of the cultivated area and 48 per cent of the farms (Herath et al: 1980:15). It has been suggested that single and two component farm types were derived through the process of fragmentation of traditional three component farms. Within the three basic farm types, farming systems vary according to the cropping pattern. Lowlands are mostly occupied by rice and supply the staple food. Part of the lowland production may go to the market. Cropping patterns in homegarden are very much related to consumption needs of the farm family and are sometimes combined with animal rearing. Highland cultivations are mostly commercially oriented and are determined by environmental, agronomic and economic factors.

The small farm sector of Matara district too, can be explained on the basis of above described three-fold pattern of land use and the three basic farm types identified. In 1982 three, two and single component farm types represented respectively 17, 31, and 52 per cent of the farms in the small holding sector (ARTI:1982:102). These shares are very similar to the national figures.

3.4 Small scale farmers

3.4.1 Land use

Approximately 5 M acres (2 M ha) or 30 per cent of the island's land surface is utilized for permanent agriculture. The small holding sector covers 3.5 M acres (1.4 M ha) or 73 per cent of the land under cultivation. Rice is the prominent crop in the small holding sector, having 31 per cent of the cultivated area. As mentioned earlier, Matara district has 96,944 farmers who operate 198,458 acres (79,383 ha). The small farm sector includes 96,433 farmers and an area of 155,749 acres (62,300 ha). This means that the small holding sector is the dominating one in the district accounting 99 per cent of the farmers and 78 per cent of the cultivated area (Table 3.4.1).

Figure 3.2: Three-fold pattern of land use

Table 3.3: The number of farmers and area in two agricultural sectors in Matara district, 1982.

Sector	Farmers		Area	
	No	%	Acreage	%
Estate	511	1	42,713	22
Small holding	96,433	99	155,745	78
Total	96,944	100	198,458	100

Source: Department of Census and Statistics:1982a:07.

Table 3.4: Structure of the small holding sector in Matara district, 1982.

Size class (acres)	Holdings			Area		
	No.	%	Acc. %	Acreage	%	Acc. %
Less than 1/8	4,141	4.3	4.3	300	0.2	0.2
1/8 - ¡ 1/4	9,437	9.8	14.1	1,386	0.9	1.1
1/4 - ¡ 1/2	12,560	13.1	27.2	3,540	2.3	3.4
1/2 - ¡ 1	17,902	18.6	45.8	11,044	7.1	10.5
1 - ¡ 2	25,439	26.4	72.2	32,510	20.9	31.4
2 - ¡ 3	13,292	13.8	86.0	30,524	19.6	51.0
3 - ¡ 4	5,597	5.8	91.8	18,534	11.9	62.9
4 - ¡ 5	2,777	2.9	94.7	11,986	7.7	70.6
5 - ¡ 7	2,452	2.5	97.2	13,891	8.9	79.5
7 - ¡ 10	1,226	1.3	98.5	9,863	6.3	85.8
10 - ¡ 20	1,377	1.5	100.0	22,167	14.2	100.0
Total	96,200	100.0		155,745	100.0	

Source: Department of Census and Statistics:1982a:08.

3.4.2 Farm structure

The farm structure of the small holding sector provides a key to understand how the small farmers are distributed according to size classes and further, makes a stratification which facilitates comparison between distinct categories. Table 3.4.2 shows the structure of the small holding sector.

According to the above statistics, only slightly less than half (46%) of the holdings are less than one acre (0.4 ha)and account for 11 per cent of the total area cultivated in the small holding sector. Another 40 per cent of the farms are in the size class of 1 - 3 acres and cover 41 per cent of the cultivated area. In all, 86 per cent of the farms are less than 3 acres (1.2 ha) and cover half of the area cultivated in the small holding sector. With respect to farm size, farms are heavily concentrated at the small end of the size scale. The average size of a small holding has been

Table 3.5: Distribution of farmers according to land ownership in small holding sector in Matara district, 1982.

Size class (acres)	Farmers			Area		
	No.	%	Acc. %	Acreage	%	Acc. %
1	38,620	44.9	44.9	13,620	11.3	11.3
1 – ¡ 2	22,571	26.2	71.1	24,651	20.5	31.8
2 – ¡ 4	17,429	20.3	91.4	36,434	30.2	62.0
4 – ¡ 7	5,008	5.8	97.2	19,976	16.6	78.6
7 – ¡ 10	1,169	1.3	98.5	7,955	6.6	85.2
10 – ¡ 20	1,255	1.5	100.0	17,871	14.8	100.0
All classes	86,052	100.0		120,507	100.0	

Source: Department of Census and Statistics:1982a:11.

estimated as to 1.6 acres (0.6 ha), which is below the national average of 1.9 acres (0.8 ha). This implies that population pressure is relatively high in the district and that as a result, fragmentation has taken place in a drastic form.

Land ownership is another important aspect of the small holding sector. Available data illustrate that 11 per cent of the farmers in the small farm sector do not own any land while 41 per cent of the farmers own only home gardens. However, it is worthwhile to note that 67 per cent of all farmers own home gardens. Therefore, the home garden is one of the components which should receive attention of development efforts but only after careful analysis because of its complexity. Land ownership can be classified according to acreage. The distribution of owner farmers across the size classes indicates that 45 per cent own less than one acre and account for 11 per cent of the total land owned. On the other hand, 1.5 per cent of the farmers own 15 per cent of the total area owned. Table 3.4.2 illustrates the distribution of farmers according to land ownership.

Recent statistics show that the area cultivated under rice in the district is 50,289 acres (20,116 ha) in the district. In the small holding sector, 61 per cent of the holdings and 36 per cent of the area comes under rice culture. Of the rice land, 8,764 acres (3,506 ha) or 17.5% are fed by large irrigation schemes, 12,624 acres (5,050 ha) or 25% by minor irrigation schemes, and 28,901 acres (11,560 ha) or 57.5% by rain (Government Agent's Office: 1985-86:02). One of the distinct features of the rice sub-sector is the small size of the holdings. Fifty seven per cent of the rice holdings are less than one acre and account for about 24 per cent of the rice area. Further, 85 per cent of the holdings are less than two acres and claim 56 per cent of the rice acreage. In contrast, an insignificant percentage of holdings come above 10 acres. Table 3.4.2 shows the distribution of rice lands according to size classes. An important fact to note is that the larger share of holdings and of area is cultivated by tenants (46 per cent of the holdings and 44 per cent of the acreage).

The facts presented in the preceding paragraphs demonstrate the dominance of rice culture and the significance of the small holdings in the district. I emphasize these points to highlight the vital need for improving the small farm sector, especially the rice sub-sector. It is for this reason that the present study focuses on small scale rice farmers.

3.5 Trends in rice culture

Rice production in Sri Lanka has shown a significant increase from 28.9 M. bushels (0.6 tons) in 1952 to 127.6 M. bushels (2.4 tons) in 1985 and has achieved an annual compound growth rate of 4.6 per cent for the reference period (Nanayakkara: 1987:02). The production has almost trebled over the past 25 years. The reason for this tremendous production increase is two-fold. First, more and more land has been developed and brought under rice cultivation. Second, per acre yields have been continuously increased through breeding programmes and modern cultural techniques. The rice acreage, average yield and production for the period 1952-85 can be found in Appendix 1. The rice area has been increased from .9 M. acres (0.4 M ha) in 1952 to 1.7 M acres (0.7 M ha) in 1985. This has shown an annual compound growth rate of 1.8 per cent for the period. The island-wide positive production trend observed during the past period is strongly associated with the new land brought under cultivation by large scale irrigation projects, specially in

Table 3.6: Distribution of rice land according to size classes in the Small holding sector in Matara district, 1982.

Size class (acres)	Holdings			Area		
	No.	%	Acc. %	Acreage	%	Acc. %
1/8	689	1.8	1.8	45	0.1	0.1
1/8 – ¡ 1/4	3,071	8.0	9.8	459	1.1	1.2
1/4 – ¡ 1/2	6,531	17.1	26.9	2,054	4.9	6.1
1/2 – ¡ 1	11,412	30.0	56.9	7,361	17.6	23.7
1 – ¡ 2	10,550	27.7	84.6	13,541	32.3	56.0
2 – ¡ 3	3,388	8.9	93.5	7,652	18.3	74.3
3 – ¡ 4	1,446	3.8	97.3	4,678	11.2	85.5
4 – ¡ 5	543	1.4	98.7	2,317	5.5	91.0
5 – ¡ 7	341	0.9	99.6	1,863	4.4	95.4
7 – ¡ 10	113	0.3	99.9	895	2.1	97.5
10 – ¡ 15	41	0.1	100.0	468	1.2	98.7
15 – ¡ 20	15	-	100.0	246	0.6	99.3
20	12	-	100.0	299	0.7	100.0
All classes	38,152	100.0		41,878	100.0	

Source: Department of Census and Statistics:1982a:16.

the dry regions. The Mahaweli Development Programme had envisaged the ultimate development of 901,550 acres (360,620 ha) of land out of which 654,55 acres (261,82 ha) is new land (Ministry of Finance and Planning:1983:71). In the project area, the acreage of rice sown has increased from 68,278 acres (27,311 ha) in the 82-83 Maha season to 93,010 acres (37,204 ha) in the 85-86 Maha season (Department of Census and Statistics: 1986:171).

The average yield of paddy has shown a significant improvement. It has increased from 31 bu/ac (1,612 kg/ha) in 1952 to 67 bu/ac (3,484 kg/ha) in 1985. This implies an annual compound growth of 2.4 per cent. This vital increase in the national average yield during the past three decades has marked a remarkable break-through in Sri Lankan rice culture. An increase in average yield has been observed from the beginning of the 20th century, but a distinctive sharp rise in the trend came after the introduction of HYVs. The greater part of this achievement was attributed by the HYVs developed at the local rice research stations. In fact, improved varieties introduced through the international rice research stations first attracted rice growers, but later they were replaced by locally bred HYVs. A significant increase came through the screening of 'BG' varieties at the Batalagoda rice research station. In fact, rice research was granted first priority in field crop research in order to achieve the staple food requirements of the nation. Rice breeders first concentrated on yield potentials. Later, breeding programmes for resistance to pests and diseases were mounted. Presently, research on rice production economics and farm management are also receiving some attention because it was realized that these areas of expertise also play a vital role in the production system of small farmers.

Even though island-wide paddy production has shown a significant increase over the past period, annual production in Matara district has shown only marginal improvement. A slight drop in rice acreage has been observed during recent years, both in Maha and Yala seasons. An increasing trend can be seen in the district's average paddy yield but a considerable gap exists when it is compared with national average production. Table 3.5 gives the paddy acreage, average yield and production in Matara district.

Table 3.7: The paddy acreage, average yield and production in Matara district, 1980-85.

Season	Acreage	Average yield		Production
	(ac)	(bu/ac)	(kg/ha)	(mt.)
Maha 80/81	49,711	41	2,132	33,172
Yala 81	46,868	47	2,444	36,199
Maha 81/82	50,094	53	2,756	43,209
Yala 82	45,730	41	2,132	28,917
Maha 82/83	49,773	56	2,912	42,690
Yala 83	33,276	44	2,288	23,664
Maha 83/84	49,417	53	2,756	42,889
Yala 84	46,110	47	2,444	30,074
Maha 84/85	47,513	61	3,172	39,682
Yala 85	43,709	48	2,495	32,527

Source: Central Bank:1985b:33.48-50.

Four major reasons can be given for the decrease in rice acreage. First, the frequent occurrence of floods in the rice growing area described in section 3.2.3 as a result of increased run-off from denuded highlands have increased the risk for rice farmers. Second, the availability of alternative employment opportunities in urban areas have had a negative influence on rice farming. In fact, rice cultivation seems to become part-time farming. Third, fragmentation of paddy land has made some holdings no longer viable for sustained production. Finally, on top of all that, the increasing cost of production on one hand, and decreasing farm gate prices on the other, have caused many small farmers to stop rice farming due to marginalisation of net farm returns. In the near future this process is likely to occur at a greater scale and intensity in the small scale rice production. Therefore, it will be discussed in detail in the following section.

3.6 Marginalisation of net farm returns

Marginalisation refers here to a situation in which a farmer receives increasingly low net farm returns due to adverse economic conditions (high cost of production and low farm gate prices in relative terms) which he can not sustain. I do not use the term to refer to decreasing net returns caused by deterioration of the environment or climate. However, in both situations, decrease in net farm returns results and this, in turn, has a strong correlation with decreasing purchasing power of the farmer. As a result, in many instances, such effects will force small farmers out of agriculture. Land fragmentation also leads to a decline in net farm returns.

It has been stated earlier that rice production is mainly done by small farmers and the average size of a paddy holding in Matara district has been estimated to be 1.1 acres (0.4 ha). Available statistics show that the number of small holdings under 1 acre has increased by 21 per cent while the corresponding area has increased by 24 per cent in the small holding sector between 1973 and 1982. As a result of marginalization, some rice holdings will not be viable production units because they fail to earn sustainable net farm returns.

The cost of production of paddy cultivation has significantly increased during the past few years. A recent study has made a comparison between the seasons 78/79 Maha and 84/85 Maha which reveals that the cost per acre has been increased from Rs.1600 (US.$ 53) to Rs.4142 (US.$ 138) (Abeysekera:1986:01). In general, 60-70 per cent of the production cost is expenses for purchasing external inputs and services. The data suggest that external inputs such as hiring tractors, fertilizers and agro-chemicals have accounted for 40 per cent of the total production cost. The increase in production cost during the recent past is mainly due to relative increase in the prices of major inputs. To compensate the rising production cost, the Government has launched a Guaranteed Price Scheme (GPS) for paddy. The guaranteed price for a bushel of paddy has continuously increased from Rs 40 (1.3 US $) in 1977 to Rs 70 (2.3 US $) in 1985. During this period, the cost of production has increased by 158 per cent while the guaranteed price has increased by only 75 per cent. It has been found that net returns from an acre of rice have shown a marked decline during the recent past. In real terms, net farm returns from an acre of paddy have declined from bushels 48 (2,496 kg/ha) to 20 (1,040 kg/ha) in Maha seasons 81/82 and 84/85, respectively (Abeysekera:1986:03).

It is very clear that during the past decades a reasonable effort has been made to improve the rice sub-sector. As a result, national production has shown a tremendous increase. Rice imports have decreased from 450 mt in 1975 to 211 mt in 1985 (Central Bank: 1986:09). It is expected that self-sufficiency in rice is very close and that there will be an excess production in future. However, it may be difficult to export the surplus because a glut exists in export markets. Further, the low quality of local rice will make it difficult to compete in the world market. As a result, the surplus will stay in the local market and prices will drop. It is likely that, in relative terms, production cost will continue to increase. The drop in prices will, therefore, lead to a further reduction of net returns of rice farmers. As this process goes on, small rice farmers will increasingly become marginal farmers because they can not earn sufficient net returns from their rice plots. Röling (1987:04), has stated that new technology has provided an opportunity for efficient farmers to capture a larger market share forcing low potential areas and small farmers out of business. As we continue to serve resource-rich progressive farmers through research and extension, more surplus will come to the market. Prices will drop and in most instances, small farmers are forced out from their only employment opportunity, agriculture. Fig. 3.6 illustrates this process. In fact, the priority given to production increase per acre has become questionable, as the cost of marginalisation becomes more evident and some developing countries are now experiencing over-production of food grains (Chambers and Jiggins:1987).

As the Sri Lankan paddy sector is characterized by small farmers, and more and more paddy land is coming into production as a result of the costly Mahaweli scheme, the process described above seems inevitable. In major rice growing areas, alternative employment opportunities are limited. Hence, in most instances, small farmers will become land-less labourers or rural-urban migrants leaving their wives to look after the farm. A study carried out in the Mahaweli project area reveals that there

Figure 3.3: Process of marginalisation.

```
Services                  Farm population       At commodity
                                                market

 ----------------          ---------------       ------------
|                |        |               |     |            |
| -Research      |--->    | Large farmers |---> | -Excess    |
| -Extension     |        |...............|     |  production|
| -Infrastructure|        |               |     | -Low       |
|________________|        |...............|     |  prices    |
                          |               |     |____________|
       |--------------- | Small farmers |  <--|          |
       |                  |_______________|    | At         |
       | Out come                               | producer   |
       v                                        | level      v
 -----------------                        ------------------
|                 |                      |                    |
| Forced out from |                      |  Low net farm      |
| agriculture     |                      |  returns           |
|_________________|                      |____________________|
```

is a clear distinction between categories of rice farmers with respect to their resource base. The rich farmers have obtained considerably higher net farm returns per acre than poor farmers (Krimmel: 1982:182). Hence, with further decreasing farm gate prices, the poor give up self-employed cultivation and lease their plots to the resource richer, they themselves becoming hired labourers of the latter. This process has already been observed. Statistics show that, during the period 1977-83 the country's rice area under minor irrigation schemes and rainfed condition has decreased by 5.3 per cent and 2.2 per cent, respectively (Ministry of Finance and Planning:1983:54). It shows that farmers are moving out from paddy farming on rainfed and minor irrigated lands. In most instances, these 'move outs' are small farmers in low potential areas. As a result of such adverse consequences, poverty still prevails in the rural agricultural sector. The greatest challenge for agricultural research and extension is to serve these small farmers so as to provide them with sustainable subsistence until alternative employment becomes available.

Chapter 4

THE RICE FARMERS: A DESCRIPTION BASED ON SURVEY DATA

4.1 Introduction

This chapter describes the small scale rice farmers in Matara. The description is based on a random sample survey carried out by the author as a part of the study of the impact of the T&V system of agricultural extension on coverage and information flow. Its function in the study is to provide a representative description of the small rice farmers in Matara, against which to check the outcomes of the purposive sample drawn to assess the effects of serial communication. However, the straigthforward representative description of the small scale rice farmers based on the random sample seemed most suitable for this part of the study which focuses on a general description of the study area.

The random sample was obtained by a special sampling technique. The sampling procedure will be explained first. Thereafter, the farmers will be described.

4.2 Procedure for drawing the sample

As mentioned above, 200 rice farmers were selected by employing a special sampling technique. In fact, the study could have utilized the 'farmers' lists' developed by Agriculture Department or some other institutions as its sampling frame, but there was reason to believe that this would have led to some deficiencies due to following facts.

1. Many lists include not only rice farmers, but all farmers in the area.

2. In many lists small rice holdings were excluded.

3. Lists have generally not been updated.

Many institutions render services to all the farmers. Hence, they do not keep a separate list for rice farmers. Some institutions deal with certain category of rice farmers (e.g. irrigated farmers, farmers in a particular project area, etc.) and often, for economic reasons, small rice holdings are excluded from their coverage. Farmers' lists developed by these institutions were, therefore, not helpful for this study. It is evident that many of the rice farmers' lists were not systematically updated regularly. As a result, these lists included the names of non-farmers. Second, the lists do not include the names of farmers who started rice cultivation recently. Finally, as the continuous process of land fragmentation is not taken into account, the lists do not show accurate farm sizes. Therefore, to avoid biases due to the sampling technique, it was decided to develop a special sampling frame, even though this involved much field work.

A Matara district map was obtained by joining four 'one inch to one mile maps' (1:63360) of adjoining areas (Galle, Matara, Morawaka and Ratnapura) which were constructed by the Survey Department in 1974. A Matara district map has not yet been constructed to this scale. After demarcating the district boundary, district area was divided into 1km x 1km squares (1 km =0.625 inches). Later, eleven squares were selected randomly from the 1200 squares which fell inside the boundary. The selected squares were demarcated and their respective locations were identified by utilizing roads, rivers, mile stones, bridges, irrigation channels, tanks, rice fields, etc. on the map.

Identification of selected locations in the field was done to the best approximation. Next, all the rice farmers in the selected squares were listed by making house-to-house visits. This was done during the period of Oct 85 - Jan 86 and a trained field team has been utilized for the purpose. There were 1285 rice farmers and this list was used as the **sampling frame**. Finally, 200 farmers were drawn randomly from it. Fig. 4.2 illustrates the procedure followed.

4.3 Field investigation

Field data collection was done by utilizing a questionnaire (Appendix 2). This questionnaire was pre-tested with 10 farmers who fall outside the sample. Certain questions were re-adjusted following the results of the pre-test. Data collection was carried out during the period of Feb - June 1986 and reference period for the data gathered is the 85/86 Maha season. During the survey, sixteen farmers were substituted for various reasons, eight because of difficulties in contacting them, five refused, and three provided false information.

4.4 Farm size

As this study focuses on rice farmers, the area of paddy cultivation is regarded as the farm size. It is evident that 47 per cent of the rice farmers cultivate 0.5 acre (0.2 ha) or less and cumulatively 78 per cent of them cultivate 1.0 acre (0.4 ha) or less. This indicates the dominance of small rice farmers in the rice sub-sector of the district. In contrast, only 19 per cent of the rice farmers cultivate more than 1.0 acre (0.4 ha). Further, 68 per cent of owner farmers cultivate 0.5 acre or less while only 44 per cent of the tenant (Ande) farmers fall into this category. It seems that owner farmers cultivate smaller rice areas than tenants. The reason for this may be that the tenant farmers have to pay rent and that it may not be economical for them to cultivate miniature pieces of land. It has been demonstrated that the net farm return has shown a decreasing trend. Further, rent is paid in kind and generally it is a fixed amount. Hence,

Figure 4.1: The random sampling procedure.

```
1. Obtained the district                |
   boundary                             |
2. Divided the district                 |
   into 1km x 1km squares               |
3. Randomly selected 11                 |
   squares                              |
4. Listed  all the rice                 |
   farmers in those squares             |
5. Randomly selected 200 farmers        |
                                        v
                           ________________
                          |                |
                          | Sampling frame |      ______________
                          |                |     |              |
                          | 1285 rice      |     | Final sample |
                          |                |---->|              |
                          | farmers        |     | 200 farmers  |
                          |________________|     |______________|
```

it is clear that the tenant cultivator's share has steadily declined. This process may have expelled the miniature tenants from rice cultivation. However, the owner farmers are free from land rent and even a small piece of land will contribute to their consumption needs of staple food. The qualitative field work shows that there is an increasing trend for rice to be considered as part-time farming especially in the agro-ecological zone WL−4. However, many of the rice farmers who own their rice fields are customary bound to rice culture. The average size of a rice holding approximates 0.8 acre (0.3 ha). This figure is very similar to the figure reported by the Department of Census and Statistics.

4.5 Rice varieties

The development of the peasant-based rice economy dates back to ancient times. Even today, rice is the only annual crop in the district which is of national importance. Up to the mid-fifties, traditional rice varieties dominated the rice economy. During the late fifties and early sixties, with the introduction of old improved HYVs such as H-4, H-5, H-7, H-8 and the well known IR-8, the traditional varieties were gradually replaced. Later, these varieties were replaced in turn by new improved HYVs commonly known as 'BG' varieties. At their introduction BG 11-11 gave considerably higher yields than IR-8 in most of the locations and hence, rice farmers were highly attracted by this innovation. In fact, such trends were observed in almost all the rice growing areas in the country.

With respect to Matara district, this study demonstrates the following results. Among the rice farmers, approximately 59 per cent were using HYVs of 4 months duration. Traditional rice varieties were used by 29 per cent of the farmers. Only 12 per cent of the farmers used 3 - 3 1/2 month rice varieties. In all, it seems that long duration (4 - 4 1/2 months) rice varieties were preferred by most of the rice farmers in the district. Two main reasons may be mentioned. First, farmers want to extend the harvesting period beyond the rainy season, as it is essential to have completely dry weather for the ripening stage. For short duration rice varieties, the ripening and harvesting period may occur during the latter part of the rainy season. Hence, there is a considerable risk associated with the cultivation of short duration rice varieties. Second, long-duration rice varieties have shown higher average yields over traditional and short duration rice varieties. However, it is evident that following natural hazards, specially floods at the initial stage of the cultivation season, short-aged rice varieties are in demand. This is because many farmers request such varieties to replant their fields.

The government has played an active role in disseminating HYVs in the district, especially by arranging for the supply of seeds and promoting the use of the technology required for their wide-spread use. The Department of Agriculture has taken the responsibility of seed multiplication and distribution. The seed multiplication network is closely supervised and controlled by the state. Through this network, farmers receive certified seeds. However, this study demonstrates that 40 per cent of the farmers do not use certified seeds regularly. It is evident that some state supplied seeds were not adequately checked for the moisture content, cleanliness and germination capacity. Approximately 25 per cent of the farmers who did not obtain certified seeds gave the above reasons as they have experienced poor economic gains. These farmers use seeds raised on their own farms. In fact, they reserve separate plots to grow breeding stock. Further, these farmers stated that their seeds are equally good as certified seeds in yield performance and other characteristics.

4.6 Water availability

Rice farming is carried out in two cultivation seasons namely, Maha and Yala. The sequence of activities in the cropping calendar is largely determined by the rainfall pattern in each season. Almost all the farmers who receive sufficient water for the crops were engaged in double-cropping. Only 30 per cent of the farmers were certain about water availability for their rice fields as they receive water from major or minor irrigation schemes. In such situations, double-cropping is possible and the cropping index approximates 200 %. This can be regarded as an efficient land use system for rice culture. However, the majority of the rice farmers in the district are rainfed. Often these farmers do not get sufficient water and in many instances, crop failures have occurred due to drought. The study demonstrates that the rainfed farmers' cropping

Figure 4.2: A reservoir for minor irrigation.

index varies from 100-150 %. This may be because these farmers completely abandon their rice fields for one season or cultivate only part of it due to water shortage. Many research programmes are geared towards irrigated rice farming but not to conditions on rainfed farms. It is of prime importance to focus the efforts of both research and extension on rainfed rice culture.

4.7 Input use

4.7.1 Fertilizers

Since the introduction of HYVs, chemical fertilizers have been increasingly used in Matara district. This is because most of the HYVs respond strongly to chemical fertilizers. The study demonstrates that approximately 80 per cent of the rice farmers use chemical fertilizers. Almost all the rice farmers who adopted HYVs use them. However, many disparities were observed in fertilizer application practices, compared to standard recommendations. In fertilization, fertilizer type (mixture), quantity per area and time of application are regarded as key factors. All the fertilizer recommendations have paid much attention to these three factors as they directly influence the economic yield. Almost all the farmers who apply chemical fertilizers were using the correct fertilizer type. As an example, for basal dressing, V-2 mixture was used. The qualitative field work indicates that during the period of first fertilizer application mostly the above fertilizer mixture has been distributed. This may be one of the reasons which influences the correct use of fertilizer type. With respect to time of application, basal dressing was done at correct time by approximately 75 per cent of the rice farmers who use chemical fertilizers for basal dressing. This fertilization was done during final land preparation practices and most of the rice farmers regarded this as a must. However, marked differences existed between the recommendation and the quantity applied by the farmers. In fact, the standard quantity is 125 Kg/ha but many use lower amounts than this. Only 48 per cent of the rice farmers who use basal dressing have treated their fields with the correct quantity of V-2 mixture. The rest were mostly deviated from the standard by between 25-50 per cent.

However, with rising costs, fertilization has become difficult. It has been demonstrated that the fertilizer prices have increased 300 per cent over the past decade. Farmers highlighted the problems associated with chemical fertilizers. First, 57 per cent of the sample stated that higher fertilizer prices prevent them from following fertilizer recommendations. Unavailability was reported only by 7 per cent of the rice farmers. The qualitative field work revealed that fertilizers were freely available as there are many commercial firms in addition to the state owned Fertilizer Corporation. Among the other restrictions for fertilizer use, transportation problems were mentioned by some farmers.

4.7.2 Agro-chemicals

Presently, agro-chemicals are used for weeds, pest and disease control. Weed control has become a must in rice culture. Specially with the introduction of short plant type HYVs, weed control has become difficult as weeds give severe competition to the crop. Prior to the introduction of agro-chemicals, hand-weeding was done, but this is a labour-intensive operation. Hence, with traditional varieties, weeding was rarely done. Even today, farmers follow the traditional practice of impounding of water in the rice field to control weeds. In fact, this method controls the weed population in a very effective manner, specially at the early stage of the crop. However, now manuring is done extensively with chemical fertilizers, this traditional method of controlling weeds seems to adversely affect the retention of the chemical fertilizers in the soil. Therefore, the current trend is to use chemical weed control methods. The study demonstrates that approximately 80 per cent of the rice farmers have treated their fields with herbicides. Almost all the farmers who have adopted the HYVs were using chemical weed control.

As many of the HYVs are susceptible to pests and diseases, treatments have become necessary. It is evident that pest and disease outbreaks tend to occur more frequently in the district. In addition to the common pests and diseases found in the district, outbreaks of Brown Plant Hopper (Nilaparvata lagens) occurred during recent years. Research and extension have made combined efforts to control the pest. The study shows that approximately 80 per cent of the farmers in the district have treated their rice fields with agro-chemicals to control pests and diseases during the reference period. However, considerable doubt exists with respect to their correct use in terms of type, dosage and time of application.

The wide-spread adoption of agro-chemicals was greatly influenced by the introduction of HYVs. Further, nowadays many private firms promote the use of agro-chemicals for their commercial gains. However, farmers are confronted with the rising price of the agro-chemicals. Approximately 65 per cent of the rice farmers in the sample stated this as their pressing problem with respect to the use of agro-chemicals. The qualitative field work shows that agro-chemicals were used up to just before the harvest. Hence, health hazards can be expected due to residual effects of the chemicals. In recent years this has become a key issue for agricultural production, specially with vegetables.

4.8 Labour utilization

Three types of agricultural labour can be identified. They are family labour, which does not involve wages; hired labour; and exchange labour (Attam). Family labour is used for certain types of operations, such as sowing, fertilizing, weeding and transplanting especially when fields are small. It is clear that many small rice cultivators carry out almost all the operations only with family labour. Even children contribute to labour needs by helping the adults. Hired male labour is used mostly for land preparation, harvesting and threshing. Hired female labour is used for transplanting and harvesting. Exchange labour is a conventional method of labour utilization. This can be regarded as one factor which highlights the solidarity of the members of a village community. However, this method of labour is slowly fading away.

There are two peaks in the demand for agricultural labour during a cultivation season. First, at the preparatory tillage and plant establishment period and second, at the harvesting time. Generally, wage rates are slightly higher at the labour demanding periods. Present wage rates are as Rs 40.00 - 50.00 for a male and Rs 30.00 - 40.00 for a female per day (without food). During the past decade, the wage rate has been increased by about 350 %. However, there is no acute scarcity in labour even during the labour demanding periods. In the sample, approximately 25 per cent of the rice farmers use only family labour. Another, 35 per cent of them use family and exchange labour. Further, 30 per cent of rice farmers use family labour and hired labour. A small per cent of the rice cultivators operate with hired and exchange labour.

4.9 Farm mechanization

A significant characteristic of the changes which took place in the technology of rice production is the wide-spread use of two-wheeled tractors. At first, four-wheeled tractors were introduced but they were rapidly replaced by the two-wheeled tractors. In a village, few elites owned four-wheeled tractors and small rice farmers used to hire the tractors mostly for land preparation activities. However, rising fuel costs hiked the hiring charges which increased the production cost considerably. Further, four-wheeled tractors were run in full capacity only during the land preparation period. In all, they were inappropriate for small pieces of land and especially in boggy soil conditions, their operation became quite difficult. Such factors reduced the demand for four-wheeled tractors and attracted farmers to two-wheeled ones. The results of the study reinforce this fact as only 12 per cent of the rice farmers use four-wheeled tractors for any of their rice production operations. In contrast, 42 per cent of them do so with two-wheeled tractors. Two-wheeled tractors are commonly used for land preparation and threshing. As a consequence of the wide-spread adoption of two-wheeled tractors, there has been a decline in the demand for farm labourers and draft animals. It is evident that buffalo rearing has become difficult as there is not enough grazing lands for the animals in the district. This is another fact which popularized two-wheeled tractors among the rice growers. In essence, the rice farmers' tendency to use two-wheeled tractors seems to be motivated by the problems associated with hiring farm labour or hiring or maintaining draft animals. Further, rice farmers have observed the impact on the farm returns by making timely operations. In addition to two-wheeled tractors, sprayers, threshers, winnowing fans and various types of land preparation equipment, which can be hitched to two-wheeled tractors are very popular among the rice farmers in the district.

4.10 Rice yield and net farm returns

Among the rice growing districts, Matara is not regarded as an important rice producing area. Its average yields are low compared to those of other rice producing districts. In 1985 Yala season, Matara district reported an average yield of 48 bu/ac (2,496 kg/ha) while the potential average yield has been estimated to be 60 bu/ac (3,120 kg/ha). According to the results of the current study, in 85/86 Maha season, the districts' average rice yield was estimated to be 44 bu/ac (2,288 kg/ha). However, farmers' average net farm return per acre approximates to as 30 bu (1,560 kg/ha). Further, 36 per cent of the farmers received a net farm return of below 20 bu/ac (1,040 kg/ha) and another 20 per cent of them have received between 20 - 30 bu/ac (1,040- 1,560 kg/ha). These findings are similar to the findings of Abeysekara (1986:03). In fact, he has shown a decreasingly trend in net farm returns and in 1985 it was

Figure 4.3: Threshing operation: traditional to modern methods.

reported to be 20 bu/ac (1,040 kg/ha).

As mentioned earlier, 78 per cent of the rice farmers cultivate 1 acre or less. There is not much difference between average net farm returns of the two important farm size categories, 0 - 0.5 acre (47 per cent of the farmers) and 0.6 - 1.0 acre (31 per cent of the farmers). The two farm size categories have obtained a net farm return of 30 bu/ac (1,560 kg/ha) and 31 bu/ac (1,612 kg/ha) respectively. However, it is hard to sustain operations at such a low level of net farm returns. As a result, many small rice farmers may have to leave the only employment opportunity available to them. What is important to state here is that the increases in national production or average yields do not reflect the situation of small rice farmers whose conditions have not improved yet. Fortunately, some scientists are beginning to think about their problems, at least to provide small farmers with sustainable subsistence until alternatives become available.

4.11 Pre-seasonal meetings

Pre-seasonal meetings are held just before every cultivation season. In fact, these meetings can be regarded as informal bodies functioning in village communities to make decisions on farming practices. These meetings were introduced prior to the T&V system, but, at present, they are incorporated in the T&V network, and have become more formal bodies. They make an attempt to liaise the farmers with relevant departments. Generally, these meetings are organized with the farmers whose rice cultivation depends on a particular anicut (An anicut or tertiary canal serves many Yayas. A Yaya consists of adjoining paddy fields belonging to different farmers). The main objective of these meetings is to decide on dates for water distribution, rice varieties for the coming season, and planting dates and to convey special messages relevant at that particular time. The study found that only 55 per cent of the rice farmers participated in the pre-seasonal meeting which was held prior to the reference cultivation season, 85/86 Maha.

Example
A pre-seasonal meeting was held in a temple premise. There were about fifty farmers and seven officers attached to different Departments. It started around 2 p.m. and lasted for three hours. This meeting was headed by an Assistant Government Agent (AGA), and officials from the Departments of Irrigation and Agriculture participated. The range AI and four KVSs were present. Many questions related to water supply were brought up by farmers, but existing drought condition prevented making definite decisions.

4.12 Social indicators

Most of the rice farmers (40 %) in the sample fall into the age group of 41-60 years. Further, 22 per cent of them were between the ages of 25 to 40 years. The rest were above 61 years of age and almost all of them have children to take over the farm. There were 88 per cent male farmers and 12 per cent female farmers. Further, 98 per cent of rice farmers were married and many of them have children above 10 years of age. In fact, this is an important labour resource. Average family size seems to be between 5 - 6 members. Generally, well-off farmers live in well constructed houses. Many of them receive a considerable amount of income from other sources, in addition to rice farming. There were about 20 per cent of them. Approximately 30 per cent of the rice farmers live in moderately built houses. The rest, lives in poorly built houses or cadjan huts. Many of them were tenant farmers. In addition to rice, many farmers engaged in home gardening and highland cultivations with vegetables and minor export crops. Few farmers were doing dairying and poultry keeping. The following cases are illustrative.

Farmer 1

A Contact Farmer, cultivates 1.5 acres (0.6 ha) of owned rice field; receives water from a minor irrigation channel, and is able to cultivate both seasons; has obtained a paddy yield of 50 bu/ac (2,600 kg/ha) in the last season; cultivate rubber, banana and vegetables on a small scale and recently established a poultry unit; he owns a two-wheeled tractor and other implements which are necessary for rice cultivation; and lives in a well-constructed house which is surrounded by a well-managed homegarden.

Farmer 2

A Follower Farmer, cultivates 1 acre (0.4 ha) of rainfed owned rice field; a full time farmer but cultivates only one season due to water shortage; has obtained a paddy yield of 40 bu/ac (2,080 kg/ha) in the last season; cultivates cinnamon and tea on a small scale; lives in a moderately built house.

Farmer 3

A Follower Farmer, cultivates 0.5 acre (0.2 ha) of rice field; a tenant and a full-time farmer; cultivates both seasons as he receives water from an irrigation channel; does home gardening on a miniature scale; lives in a cadjan hut.

4.13 General extension

The T&V system of extension introduced in the district distinguishes between CFs with whom the extension worker is supposed to have direct contact, and FFs who are supposed to get information from CFs. The CFs represent 7 per cent of the sample. In fact, the formal system insists on a figure of 10 per cent. None of the CFs in the sample was equipped with a list of FFs. Most of them were not clear about their roles as CFs. Further, their liaison with FFs seems to be weak as many of them do not know their FFs. On the other hand, only 33 per cent of the FFs reported that they know their respective CFs. Among the FFs who know their CFs, only 20 per cent stated that they receive some messages from CFs on and off. One third of the farmers (32%) maintain contact with KVSs (Department of Agriculture) for their farming matters. The Cultivation Officers (COs) belong to another institution, but they perform duties at the village level by rendering non-technical services. Cultivation Officers were regarded as extension contacts by 25 per cent of the farmers. Only 39 per cent of the farmers have observed some change in general extension work during the past five years. Such changes were observed mainly in Yaya organization, demonstrations and farmer training classes, rather than in regular extension contacts.

Chapter 5

THE AGRICULTURAL EXTENSION SERVICE IN SRI LANKA

5.1 Evolvement of the agricultural extension service

5.1.1 Pre-Independence period

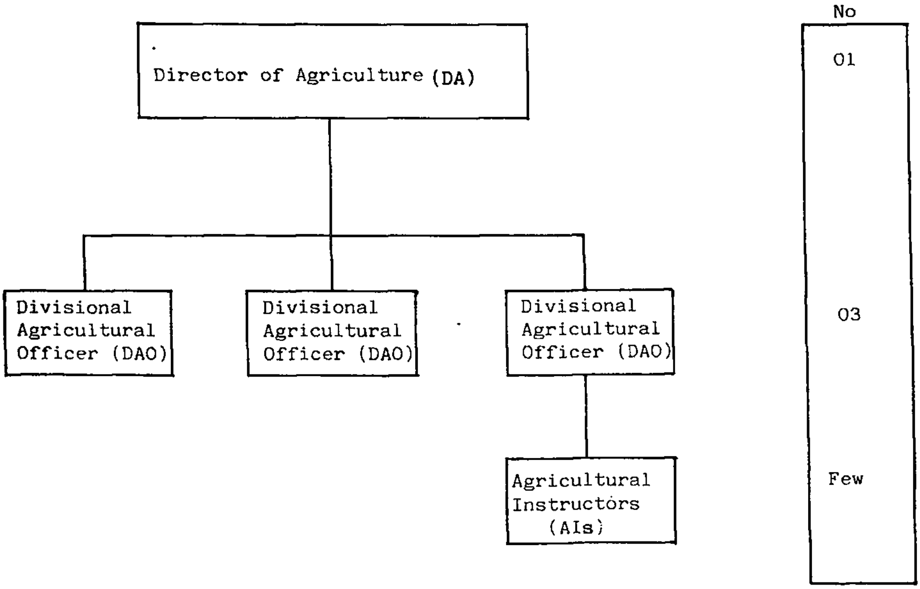
During the period of foreign rule much attention was paid to develop the plantation sector, but the need for a separate extension service for this was not highlighted, mainly because plantations were managed by private agencies which were well-equipped to provide all the necessary inputs, including technical advice. The foreign ruler paid very little attention to improve livelihoods in the rural areas and, hence, there was almost no extension service to serve local farmers. Yet, local farmers made up the largest single professional category with a great number of small holdings. Further, they were largely responsible for the production of food. However, in 1880 four Agricultural Instructors (AIs) were appointed for the entire country, but they were mainly responsible for the collection of revenue and maintenance of various agricultural laws. Their contribution to agricultural development was insignificant and their appointment can hardly be considered as the beginning of agricultural extension in Sri Lanka. Next, in 1904, the Ceylon Agricultural Society was established. It rendered some extension activities to farmers in collaboration with Government Agents (GAs), but the results were not impressive (Abeywardena:1984:03).

In 1912, the Department of Agriculture was formed at the Royal Botanical Gardens in Peradeniya. However, this institution also paid attention to the plantation sector, rather than serving the rural population. This situation changed in 1920, when three separate Research Institutions were established for Tea, Rubber and Coconut and the Department of Agriculture was given the responsibility to develop the peasant sector. In 1923, the entire country was divided into three divisions and Divisional Agricultural Officers (DAOs) were appointed to head them. In addition, a few Agricultural Instructors (AIs) were appointed to assist DAOs. Fig. 5.1.1 illustrates this framework. This system was expected to fulfil tasks, such as advice, research, management of government farms and veterinary services. Later, during the 2nd World War, a pressing scarcity of rice provided another strong motivation for focusing government's attention on the rural sector. Hence, the Department's field staff was enlarged and the Paddy Advisory Board was established to advise the government on self-sufficiency in rice. Moreover, other food crops also received attention. To support these tasks, large irrigation projects, dry zone settlements, fertilizer subsidy schemes, credit schemes and guaranteed price schemes were undertaken.

5.1.2 Post-Independence period

As in many other developing countries, the Sri Lankan Agricultural Extension service really started as a post-independence phenomenon. The renovation and reconstruction of the irrigation systems made provision for new land under rice, but the production per unit of land area remained very low as the farmers were using traditional rice varieties. So they remained at the subsistence level. Furthermore, highland rainfed food crops were grown on 'Chenas' — a method of shifting cultivation, with a very low cropping intensity. The proportion of area under cultivation in relation to the total area available for arable farming was low as cropping index of 33 (Ruthenberg: 1980:15-16). At this stage

Figure 5.1: The early extension network in 1923.



the government recognized that the adoption of improved varieties and cultural practices might present a solution to the problem and this created an urgent need for an effective system of communication between state agricultural authorities and farmers. Therefore, the extension staff was enlarged once more, but extension service remained weak within the context of the Department of Agriculture due to the following facts (Abeywardana: 1984:04):

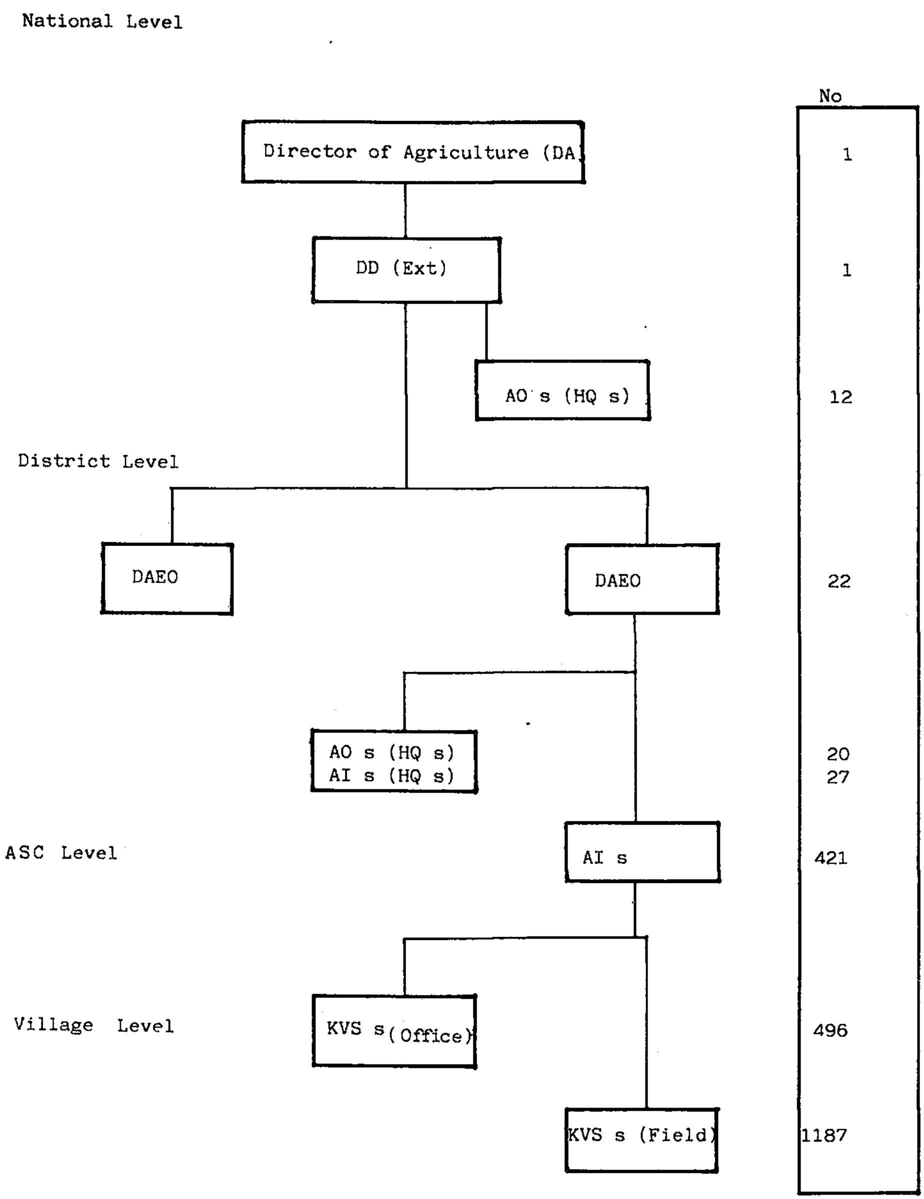
1. A lack of national planning and coordination,
2. An insufficient number of extension workers to maintain direct contact with farmers,
3. A lack of coordination between research and extension,
4. Limited training facilities to upgrade the technical knowledge of the extension staff,
5. Multi-purpose duties assigned to extension workers.

The lack of coordination between relevant institutions was highlighted as a main limitation to the effectiveness of the services in the peasant sector. Therefore, measures were taken to coordinate the different departments dealing with food production. This resulted in the establishment of a Department of Food Production under the Ministry of Agriculture in the early fifties, but it was abandoned in 1957 as it failed to meet the objectives. At this stage, an inappropriate technology for the farmers' socio-economic conditions and an acute shortage of extension workers were the two major barriers affecting the progress of the peasant sector. To overcome these limitations, measures were taken to strengthen agricultural research and extension. First, zonal research stations were opened to deal with zonal problems and further, special attention was paid to rice breeding. Second, the extension staff was enlarged once more and a new organizational framework was introduced.

The real breakthrough came after the introduction of the first improved rice variety called H-4 in 1957. It gained a remarkable popularity over the traditional varieties and more than 50 per cent of the rice farmers adopted it within five years. After the adoption of this variety, the requirement for better management practices and the demand for inputs greatly increased. Therefore, improvement of the farmers' technical knowledge became essential. In this context, farmers' training classes, field demonstrations and production kits were presented to the rice farmers, but the number of extension workers in the service to perform such tasks was highly insufficient.

In 1957, two significant changes took place in the extension set-up. First, the District Agricultural Officer (DAO) was replaced by the District Agricultural Extension Officer (DAEO) and each administrative district was made under the responsibility of one DAEO, so that total of 22 were appointed. For the first time, village level extension officers were appointed with the name KRUSHIKARMA VIYAPTHI SEVAKA (KVS). The appointment of DAEOs and KVSs marks the establishment of the first significant Agricultural Extension Service in Sri Lanka and may be seen as a major reform of the organizational structure of agricultural extension. Further, the basic concept of agricultural extension — to assist small farmers by enabling them to upgrade their living standards, was formulated. As extension activities became more and more intensive, the extension staff was further increased. A separate Extension Division in the Department of Agriculture under a Deputy Director Extension (DD Ext) was established in 1963. The organizational framework of the extension service continued to improve after the first reform, especially increasing its manpower. Agricultural Officers (AOs) were appointed to serve at the national and district levels. They were assigned as Head Quarters Agricultural Officers. A number of Agricultural Instructors (AIs) were also appointed as Head Quarters Agricultural Instructors. The Agricultural Service Centers (ASCs) were established to accommodate the field Agricultural Instructors. They were assigned to an area called the Agricultural Instructor's range. In 1970 their number was about 500. For each ASC, one KVS was assigned as the office KVS and each agricultural instructor range was sub-divided into KVS divisions. This organizational framework continued till the beginning of this decade (Fig. ??).

Figure 5.2: The Sri Lankan extension framework in 1980.



Source: Abeywardena:1984:28

5.1.3 Discussion

Even though the number of the extension staff was gradually increased, the link between farmers and extension service was not seriously considered up to the recent past. Until 1957, the extension structure did not take this vital fact into account. After the appointment of village level extension workers — the KVSs, the 'extension - farmer' gap was bridged. This facilitated two way-communication between the farmers and the extension network. In addition to the extension - farmer link, some attention was also paid to the 'farmer - extension - research' linkages. Although, the extension organization therefore, had a reasonable framework in the late seventies, the links were not as effective as expected. The farmer - extension link was not built into the system and the extension messages were conveyed only on demand. The extension service was seen as a 'fire-brigade' or 'ad-hoc' service. Beside, the feedback was very limited. Hence, the extension framework did not provide a dynamic structure to facilitate effective knowledge dissemination. The extension - research link was restricted to a few dialogues between higher authorities. Therefore, farmers' problems were not conveyed in an effective manner to research, nor were research findings effectively passed on to extension. These weak linkages made extension work ineffective. At the village level, the ratio of extension worker to farm families was 1:1500. Therefore, a KVS should serve 1500 farm families, but given the limited facilities, he was unable to fulfil this task. In this context, a KVS tended to contact a limited number of progressive, rich, influential farmers with an extension advice conveyed on an ad-hoc basis. As a result, extension coverage was highly insufficient.

The ineffectiveness of the agricultural extension service was identified as one of the major bottlenecks which limit the progress of the peasant sector and the following reasons were given as prime elements (Abeywardena: 1984:22):

1. A tendency to serve progressive farmers at the expense of the more deserving small farmers,

2. A lack of systematic technical backstopping,

3. A lack of systematic extension planning and supervision,

4. An inadequate extension staff, vehicles and housing facilities,
5. Non-extension activities assigned to extension workers.

   Therefore, to overcome the above constraints, the agricultural extension service was to be strengthened without further delay. This was realized during the late seventies. By then, the environment was favourable to test an alternative approach.

5.2 Reform according to the T&V strategy

The Sri Lankan agricultural extension framework was reformed with the introduction of T&V System of Agricultural Extension (Benor and Harrison: 1977). The Department of Agriculture was responsible for policy formation, planning and execution of this reformed extension system. The following paragraphs will explain the **formal extension system** formulated by the Department of Agriculture to introduce the T&V model. This system was first introduced into one of the dry zone districts — Anuradhapura, in 1975 on a pilot scale and subsequently extended into some selected areas in other districts (von Blanckenburg et al: 1980: 03). After this experiment, the political decision was taken to implement the system islandwide and financial assistance was granted by the World Bank under the 'Agricultural Extension and Adaptive Research Project' (AEARP). In the perspective of the evolution of the extension system in Sri Lanka, this event may be seen as the second reform in agricultural extension. The AEARP has three broad components to be dealt with: the application of T&V system throughout the country; the strengthening of adaptive research and, the improvement of the training of extension workers (Department of Agriculture: 1985:01). In this extension reform, the following features were moulded into the extension framework to be in line with the T&V system. They are:

(a) The training component for extension workers was operationalized in the form of a regular **fortnightly training** for Agricultural Instructors (AIs) and KVSs. Therefore, the first main concept of the T&V system was paid a great deal of attention.

(b) Extension coverage was strengthened by assigning a regular farmer **visit schedule** to KVSs. Therefore, the next important concept of the T&V system also received attention.

The term **Training and Visit** are applied to this extension strategy, because the basic principles of the system stress that the best way to achieve an effective extension system is, to keep extension staff up-to-date with respect to the latest know-how by regular, frequent **training** and to have extension workers make field **visits** according to a fixed schedule known to all farmers (Benor et al: 1984:09).

(a) The creation of a professional unified extension service with vertical coordination by the Deputy Director Extension (DD Ext). This operationalizes the requirement of a **single line of command**.

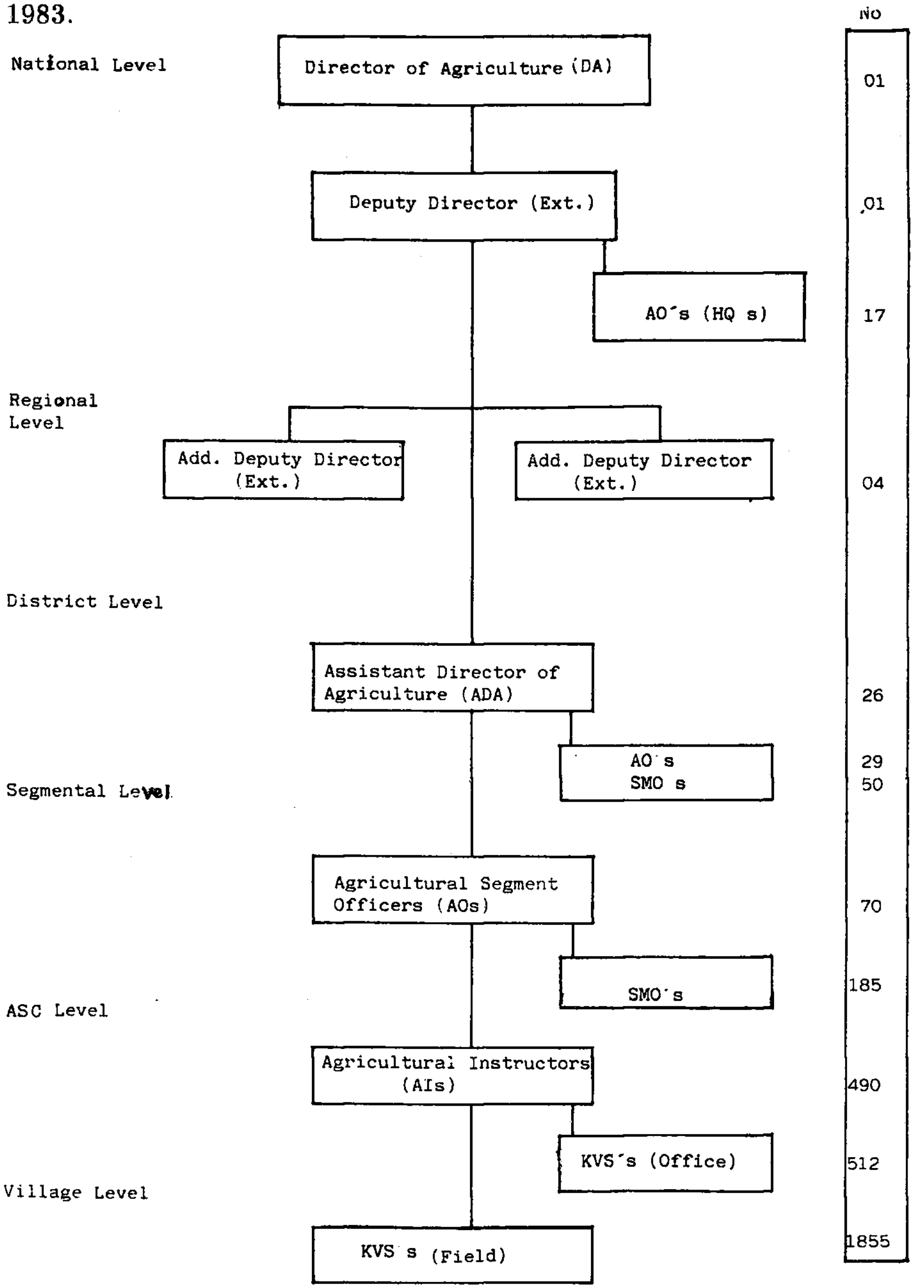
(b) Extension workers were instructed to perform full-time extension work so as to guarantee **extension exclusiveness**.

(c) To make the **Extension - Research linkage**, Regional Technical Working Groups (RTWGs) were formed. District extension programmes can be prepared in conformity with the priorities laid down by the RTWGs to have a direct impact on agricultural production. Furthermore, pre-seasonal training programmes for Subject Matter Officers (SMOs), Agricultural Instructors (AIs) and KVSs could be conducted at the Regional Training Centers (RTCs) on the subject matter recommended by the RTWGs.

(d) An effort was made to formulate simple and appropriate **messages** which would be conveyed to farmers by the KVSs.

To facilitate these tasks, the extension staff was enlarged another time and the District Agricultural Extension Officer (DAEO) was re-designated as Assistant Director of Agriculture (ADA) to head the District. Two new cadres, Subject Matter Specialists (SMSs) and Subject Matter Officers (SMOs) were created. To establish the single line of command, the functional elements of the system were re-arranged. Fig. 5.2 illustrates the Sri Lankan extension framework reformed in accordance with the T&V strategy.

Figure 5.3: The reformed Sri Lankan extension framework in 1983.



Source: Abeywardena:1984:30

The Director of Agriculture (DA) and Deputy Director Extension (DD Ext) function at the national level. They form links with the other relevant institutions and mainly deal with administrative matters. Additional Deputy Directors of Extension (Add DDs Ext) were appointed to assist the Deputy Director Extension (DD Ext) and each of them is responsible for planning, guiding and supervising extension activities in a region covering 5-7 districts. The Additional Deputy Director (Ext) assigned to the southern region covers five districts: Gampaha, Kalutara, Galle, Matara and Hambantota. The Assistant Director of Agriculture (ADA), Agricultural Officers Head Quarters (AOs HQs) and Subject Matter Officers Head Quarters (SMOs HQs) are attached to the district level. The segment Agricultural Officers (AOs) and Subject Matter Officers (SMOs) serve at the segmental level. Agricultural Instructors (AIs) and KVSs serve at the Agricultural Service Center (ASC) and village level, respectively. The Subject Matter Specialists (SMSs) function at the regional level, but from the administrative point of view, they are subordinated to the Deputy Director Training (DD Training). The Regional Research Center (RRC) is headed by Regional Deputy Director (Research) — DDR and the Research Officers (ROs) fall under his administrative and technical supervision. The Regional Deputy Director (Research) is responsible to his divisional head at the national level — the Deputy Director (Research). This reformed extension structure, with its single line of command and strong vertical coordination, is expected to facilitate effective communication from the national level down to the farmer level, and vice versa.

The KVSs receive one-year pre-service training from the practical farm schools. Normally, they are lower secondary school leavers. The AIs are two-year agricultural diploma holders. They receive training at agricultural schools and recruitment requires an upper secondary school level of education. The SMOs are AIs with some years of field experience. The AOs are agricultural graduates who have followed a four-year BSc (Agric) degree, or AIs with 10-15 years of experience. The SMSs are also generally agricultural graduates. The ROs hold either a science or an agricultural degree. Senior positions, such as ADAs and DDs are chaired by experienced personnel in the extension organization.

5.2.1 Coverage

The number of extension workers was increased in order to obtain a better extension coverage. The ratio of extension worker: farmer was intensified to 1:750. A regular farmer **Visit** schedule for KVSs was developed. To facilitate the regular farmer visit schedule, the farm population was sub-divided. First, the farm population covered by a KVS was divided into six clusters, each with 125 farm families approximately. Second, each cluster was divided into six groups and each group had an average of 21 farmers. Each group of farmers had one farmer in the group selected as a Contact Farmer (CF). Normally, 36 CFs were assigned to one KVS, and according to the KVS's bi-weekly schedule, six days were allocated for farmer visits. Therefore, the KVS should visit six CFs a day. The CFs assist the KVS in informing the other members of the group, and they assist the Follower Farmers (FFs) by regularly visiting them and by attending farmer group meetings. The CFs act as the main contact point for the KVS. However, the KVS should not limit his visits to the meeting of CFs, but he should always try to meet the members of the group. His visits are to be extended to individual farmers when required. Fig. 5.2.1 shows the planned sub-division of the farm families on the village level. For a successful implementation of the T&V system, an identification of the group and the contact farmer is a prerequisite. Therefore, the officers had to look for suitable CFs, and once selected, the quality of the CF was to be continuously upgraded. The KVS has an important role in selecting the CFs.

5.2.2 The Training

Training was organized at three levels: pre-seasonal training at the regional level, fortnightly training at the segmental level and ASC training at the Agricultural Service Center level. The pre-seasonal training focuses on Subject Matter Officers (SMOs), Agricultural Instructors (AIs), and KVSs while the fortnightly training focuses

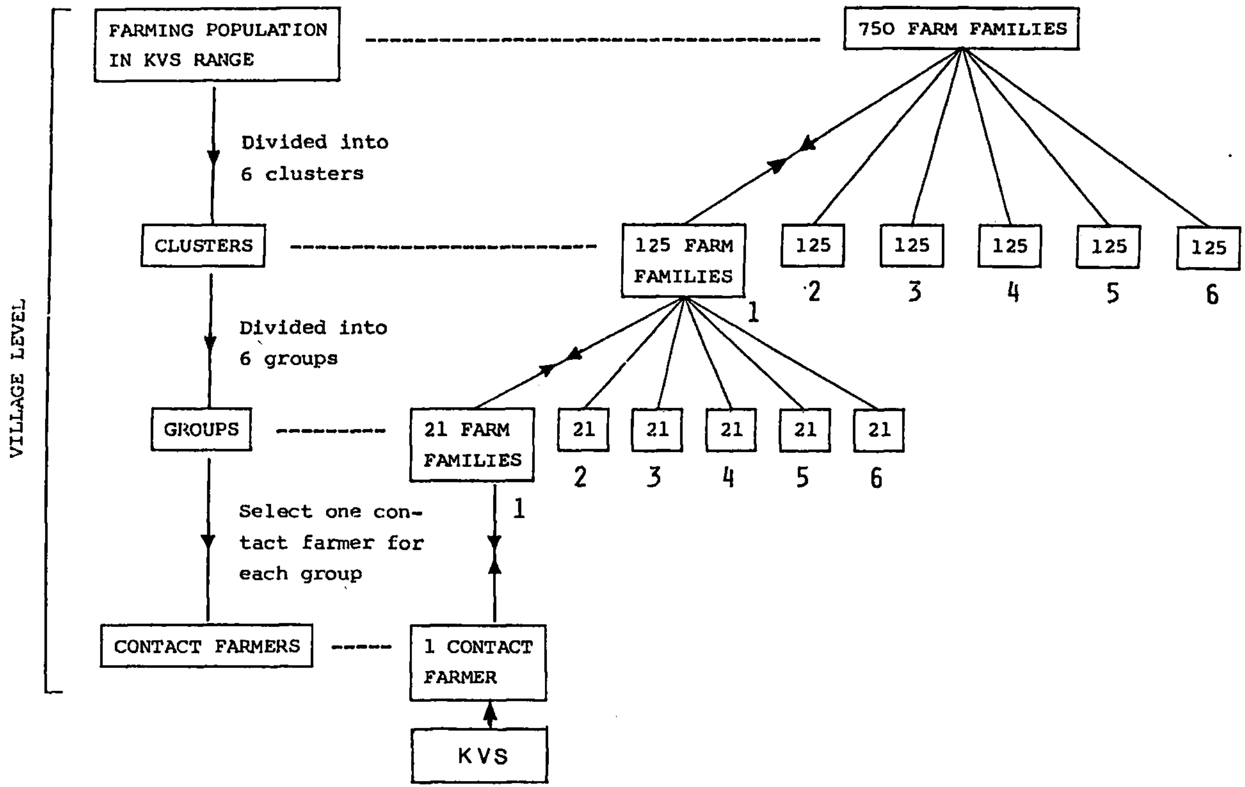


Figure 5.4: Farmer grouping and information flow according to the planned T&V system.

on Agricultural Instructors (AIs) and KVSs. The Agricultural Service Center (ASC) level training is mainly organized for KVSs.

Pre-seasonal training

Generally the pre-seasonal training is organized 60 days prior to the commencement of a season. This training is organized at the Regional Training Centers (RTCs) and took approximately five days. The subject matter of this training is based on the decisions taken by the Regional Technical Working Groups (RTWGs). The Training Officers and the Subject Matter Specialists (SMSs) at the Regional Training Center (RTC), Research Officers (ROs) and other relevant officers function as trainers.

Fortnightly training

First, the Agricultural Officers (AOs) and Subject Matter Officers (SMOs) prepare the cropping calendar for each segment. This calendar is divided into a 14 day period throughout the season from land preparation till harvest time to include post-harvest practices, such as storage. The most important subjects to be dealt with are considered at each fortnightly training session. Further, while deciding on such important subject areas, extension messages will be formulated. Next, each Subject Matter Officer (SMO) will prepare a subject matter programme for the fortnightly training sessions which is based on the cropping calendar. The AIs' and KVSs' work schedules are arranged according to the bi-weekly programmes and in those programmes one day is reserved for this fortnightly training. The subject discussed at the fortnightly training is brought forward by a month or two weeks with respect to the cropping calendar, enabling the KVS to receive sufficient training and to be able to convey extension messages to farmers allowing them to apply the know-how in time. The segmental Agricultural Officer (AO) coordinates the fortnightly training and these trainings are given at District Training Centers (DTCs). The segmental Agricultural Officer (AO) introduces the AIs and KVSs in his segment to the programmes for the following month. Attendance of AIs and KVSs is compulsory. The fortnightly training sessions are important components in the T&V system because it is during these sessions that the messages to be transmitted and implemented are conveyed. Further, the achievement of the previous extension messages can be evaluated and this facilitates the feedback. However, the main aim of this training is to equip the officers with the relevant information for the coming fortnightly farming activities.

Agricultural Service Center (ASC) level training

The KVSs training sessions are conducted at different locations in Agricultural Service Center (ASC) areas, as long as the distance to be travelled by the staff to get to the session does not take more than 1-2 hours. In the KVS's fortnightly programme, one or two days are allocated for this purpose. The range AIs coordinate these meetings, but in special circumstances Agricultural Officers (AOs) and Subject Matter Officers (SMOs) are also invited. An Office Day is held at the Agricultural Services Center (ASC) once in two weeks. Such meetings offer room to share knowledge among AIs and KVSs. Here, farmers' problems are discussed to find possible solutions. However, unsolved problems will be conveyed to the higher officials at the fortnightly training sessions.

5.2.3 Co-ordination

The Department of Agriculture under the Ministry of Agricultural Development and Research (MADR) is the programme implementation agency. At the ministry level, a programme coordination committee is formed under the Chairmanship of the Secretary. This committee coordinates policy matters with the government and ensures inter-ministerial support for the unified extension system. In addition to senior members of the Ministry of Agricultural Development and Research (MADR), representatives from relevant institutions are invited to the committee.

At the Regional level, coordination between inter-divisions of the Department of Agriculture and between other relevant institutions is strengthened by the formation of Regional Technical Working Groups (RTWGs). This is a prominent formal body established by the T&V system to achieve effective research - extension linkage. The entire country is divided into eight regions to form RTWGs. Each region has a Regional Research Center (RRC) which serves as the central location for the RTWG. Hence, there are eight RRCs namely, Maha Illuppallama, Angunakolapelessa, Gannoruwa, Bombuwela, Karadiaynaru, Mahakandura, Bandarawela and Paranthan. These RRCs are located in different agro-ecological zones. Each region consists of two or more administrative districts. As an example, Angunakolapelessa RRC serves Matara and Hambantota districts and parts of Ratnapura and Monaragala districts. Some districts do not belong to one agro-ecological zone so that different parts of such a district may be served by different RTWGs. A RTWG is formed by the Regional Deputy Director (Research), the Assistant Director of the Regional Training Center (RTC), the Assistant Directors of Agriculture (ADAs) of respective districts, the Agricultural Officers (AOs) and the Subject Matter Officers (SMOs) of the affiliated districts, the Research Officers (ROs) of the region, the Subject Matter Specialists (SMSs) and the Training Officers, the Farm Superintendents (FSs), the representatives from the national level and other relevant institutions. This formal body provides a forum for the research, extension and training officers serving in a particular region. At the RTWG sessions, decisions about research, extension and training priorities will be made for the region (for different districts on a collective basis). Generally, RTWG meetings are held 125 days before the on-coming season and take at least two days.

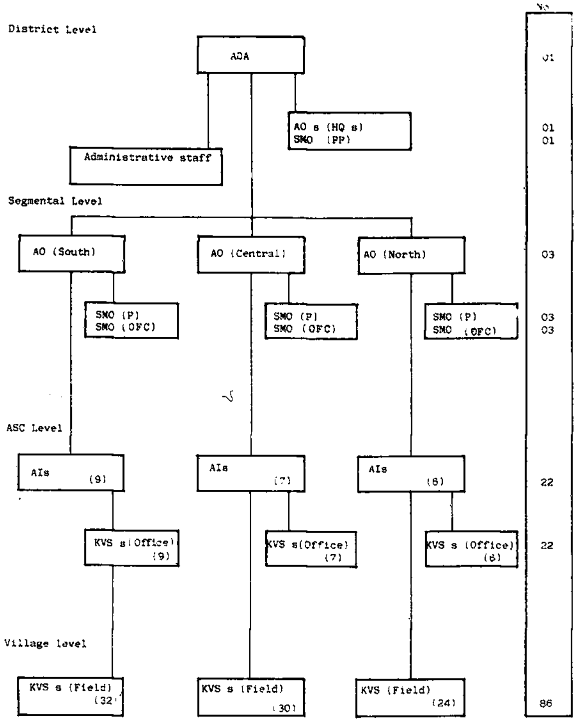
At the district level, a meeting of a preparatory team will be held 150 days prior to the on-coming season. The theme of this meeting is to prepare material for the RTWG. This meeting consists of AOs, SMOs and members of the adaptive research team. At this meeting, they will discuss and conclude their experiences from the previous season and, finally, prepare proposals for extension targets. However, a final decision on those proposals will be taken by the RTWG. After the RTWG, the district extension office will prepare the final extension programme for the district, which will be done normally 75 days prior to the on-coming season.

The monthly Research and Extension dialogue (RED) is another formal body which facilitates research - extension linkage. This meeting is held either at an extension office, or a research station, or in a farmer's field, depending on the topic of discussion. The team of participants is very much similar to that of the RTWG. At these meetings, extension officers get the opportunity to present their problems to the research officers and the research officers have an opportunity to provide solutions.

Adaptive Research Units (ARUs) which function at the district level try to develop research - extension - farmer linkages. They expect active participation of research and extension staff (also through the forums of RED and RTWG). Adaptive research trials are conducted in farmers' fields. Such trials mainly focus on testing the validity of research findings and farmer acceptability (Wirasinghe et al: 1984:99). These trials are on varietal recommendations, improved cultural practices and input utilization. Adaptive research offers an opportunity for research officers to familiarize themselves with farmers' conditions. The SMOs are responsible for training middle and village level extension workers on a regular basis. To ensure a high quality training, SMOs are supposed to acquire knowledge specifically on their own subject areas. Hence, their close contact with the research is an essential element in the formal model. It establishes a research - extension bond. Subject Matter Specialists (SMSs) are confined to the Regional Training Center (RTC) and their task is to provide regional level training. They are supposed to advance their knowledge on their respective subject areas through the findings of current research and other available sources. In addition, the Subject Matter Specialists (SMSs) are expected to participate in the research.

To facilitate important components of the system, the training and visits, the work schedules of relevant officers are organized on a bi-weekly basis. According to this bi-weekly programme, every field extension officer has fixed dates for different activities. Moreover, this work schedule provides a vital tool to facilitate functions as-

Figure 5.5: Extension structure in Matara district in 1986.



* Numbers in parenthesis indicate number of officials attached to each segment.

sociated with vertical coordination and regular supervision.

The preceding paragraphs describe the general description of the formal T&V extension system as it is formulated at the national level.

5.3 T&V in Matara District

The extension framework of Matara district is also re-organized according to the T&V system when the system was implemented islandwide. Fig. 5.3 shows the structure of the extension network in Matara district in 1986.

The district's extension network is headed by the Assistant Director of Agriculture (ADA) at the district level. There is one AO and, one SMO for Plant Protection (PP) serving at this level. The district is sub-divided into three segments namely, Southern, Central and Northern. These segments approximately correspond to the agro-ecological zones of the district. Each of these segments is administered by a segment AO. In each segment, there are separate SMOs for Paddy (P) and Other Field Crops (OFC). The segment AO, the SMO (P), and the SMO (OFC) will function at the segment level. The southern, central and northern segments consist of 9, 7 and 6 Agricultural Service Centers (ASCs), respectively, and each of them is headed by an AI. Each Agricultural Service Center has an office KVS. The AI and office KVS perform their duties at the Agricultural Service Center level. Finally, at the village level, field KVSs render service to the farmers. Generally, there are about 3-6 KVS divisions for one Agricultural Service Center and one KVS is assigned to one KVS division. At the office of the ADA, the supporting staff consists of an Economic Assistant, 16 Clerks, 3 Typists, a Store Keeper, 5 Office Work Assistants, 5 Labourers, 2 Watchers and a Projector Operator. The district office owns 11 vehicles, of which 9 are in running condition. Each Agricultural Service Center has an Office Work Assistant.

5.4 Conclusion

Throughout, I have emphasized the fact that above is the **formal system**. In chapters nine and ten, research is reported which shows the **actual** working of the system. Experience world-wide shows that it is to be expected that formal and actual systems differ widely. The main reason for this divergence is that providing an extension service implies that field workers have much room to take their own decisions. Hence, the power to determine what should happen is distributed quite differently from the power to determine what actually happens (Wagemans: 1987:333-334).

Part III

THEORETICAL PERSPECTIVES

Chapter 6

EXTENSION IN AGRICULTURAL DEVELOPMENT

6.1 The meaning of extension

Agricultural Extension developed much earlier than the extension movements in other fields such as preventive medicine, environmental protection, energy conservation etc. The term **Extension Education** was introduced by the Cambridge University in 1873 for the first time for some extra-mural activities of the university. Later, tremendous progress in rural development in the United States led to numerous modifications in the field of agricultural extension (Maunder: 1972:01). The 19th century can be characterized as a period of rapid development in the world's agriculture, but it was only after the Second World War that almost all the developing countries realized the need for an effective agricultural extension system as a development instrument (Swanson and Claar: 1984:05). Although some developing countries, there were extension organizations also during the colonial period, they tended to serve only the plantation industries. As many developing countries were liberated from foreign domination after World War two, the evolvement of agricultural extension may be viewed as a post-independence phenomenon.

It was also after the Second World War that scientists became interested in agricultural extension and now a clear distinction between **Extension Science**, often referred to as the **Body of Knowledge** in extension, and **Extension Practice** is well understood. However, up to the recent past, even though many extension programmes were designed and implemented, the body of knowledge on which practitioners could draw remained underdeveloped. Hence, extension practitioners were inadequately equipped with extension know-how, which caused part of the failures in extension programmes. Since then, many contributions have been made to develop an accessible body of extension knowledge (e.g. Mosher: 1966, 1978; Maunder: 1972; Nagel: 1980; Nagel et al: 1983; Rogers: 1962, 1983; Jones: 1986; Jones and Rolls 1982; von Blanckenburg: 1982a, 1982b; Benor et al: 1984; Benor and Baxter: 1984; Rivera and Schram: 1987; Röling: 1988a; van den Ban and Hawkins: 1988). Presently, more and more journals are interested in including extension information in their coverage. Journals, such as the **Journal of Extension Systems**, the **Journal of Extension**, the **Indian Journal of Extension** and **AERC bulletin** are devoted to rural extension. Supported by such a pool of knowledge, extension is now becoming a professional activity. Still some hallmarks of a profession, such as international association, have not as yet been achieved.

The technology-propelled agricultural development which we are experiencing today is heavily dependent on the joint action of research, extension, education and farmers. Present governments increasingly rely on extension as a policy instrument to induce voluntary behavioural change, in addition to subsidies, price stabilizations and various agricultural laws. What is more, increasing investment in agricultural extension has offered more chances to extensionists in the job market, and extension science is gaining ground as an academic specialization. The above developments lead extension science to play a more prominent role in the context of overall agricultural development. As agricultural extension may be organized in different ways to accomplish a wide range of objectives, a specific definition is hard to formulate. Extension means different things to different people (Röling: 1982:87).

In the liberal tradition extension is regarded as an instrument to help people to make well considered decisions in their own interest. However, in most familiar form, agricultural extension means providing farmers with information (knowledge) and skills to improve the output of farm enterprises. Many extensionists have defined agricultural extension (e.g. Savile: 1965:03, Mosher: 1978:33, von Blanckenburg: 1982b). Some definitions stress the transfer of knowledge or information, some deal with transfer of technology to those who need it, and some with assistance to decision-making by clients. Recent definitions emphasize the role of extension in the frame-work of knowledge systems and their development (Röling: 1985, 1988a, Engel:1987a). Confusion remains, however, as many definitions are inclined to describe what extension **should be** and not what **it is**. Hence, actual practice often does not correspond to the ideal practice explained in the definitions or in a particular formal model. In fact, in day-to-day life, people tend to explain their experiences referring to **standards** or **ideal types** which are completely different from what actually occurred.

Extension administrators often believe that they know what is good for farmers, but farmers equally often do not accept that extension agents make decisions for them. In this way, extension agents loose the confidence of farmers and become rather ineffective. Extension only 'works' on the basis of voluntary change, i.e, if it tries to integrate its objectives and Professionals have a tendency to utilize top-down strategies rather than bottom-up ones to evolve rural development programmes. As they believe that they know what is best for the target population, often unconsciously, do not systematically explore what members of the target population believe to be their needs (Den Hartog:1982:46). This approach is commonly known as top-down approach and is being utilized to implement most of the governmental programmes even today. In fact, this approach is popular, especially in places with a bureaucratic institutional framework. However, it has to be pointed out that this approach can only be applied to certain situations and moreover, that optimal adoption of agricultural innovation is achieved only when a farmer perceives the recommended practice to be, for him, technically sound, economically feasible, physically possible and socially compatible (Leagans:1985). Essentially, extension is an instrument for inducing voluntary change and it operates at the interface of goal achievement for both intervener and client.

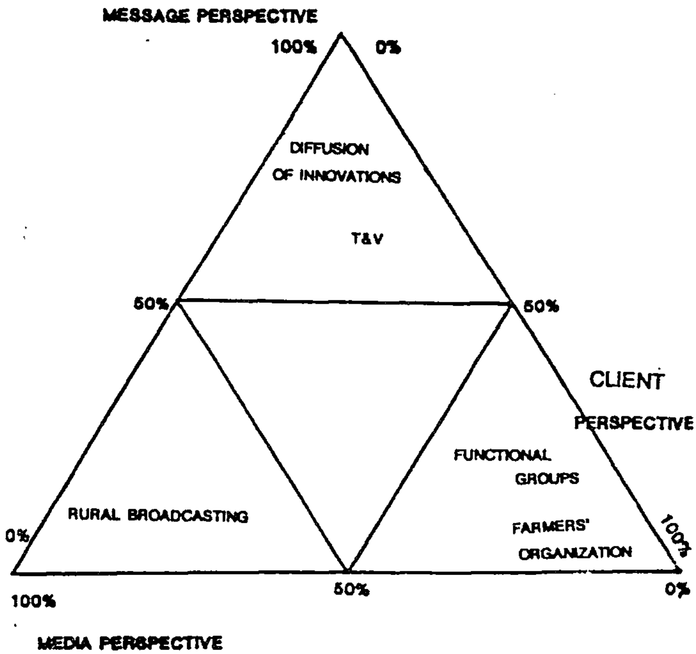
Whatever their differences, definitions of extension also have a number of common elements, such as: extension is an intervention; it uses communication to induce voluntary change; and it focuses on different target groups. Taking those common elements into consideration, agricultural extension may be viewed as, **a professional communication intervention deployed by an institution to induce change in voluntary behaviours with a presumed public or collective utility** (Röling: 1988a:50).

6.2 Orientations in extension communication

Extension communication normally refers to the media, messages and clients involved. The order and dominance of the ingredients vary with the orientation (Fig. 6.2.

The sides of the triangle in Fig. 6.2 represent an increasing degree of each component in the orientation. For an example, along the left side of the triangle the orientation may be classified as message oriented. In the classical technical innovation, orientation is concerned with the message (technology) without paying much attention to the physical, social and economic conditions of the clientele. Extension orientations evidently occupy the three corner areas of the classification. The orientations on respectively the message, the media and the client each develop certain expertise from its own dominant perspective, but in doing so, it uses the elements of other orientations to a certain degree.

Figure 6.1: Extension approaches in perspective.



Source: Engel:1987a:06

6.3 Extension in the rural development mix

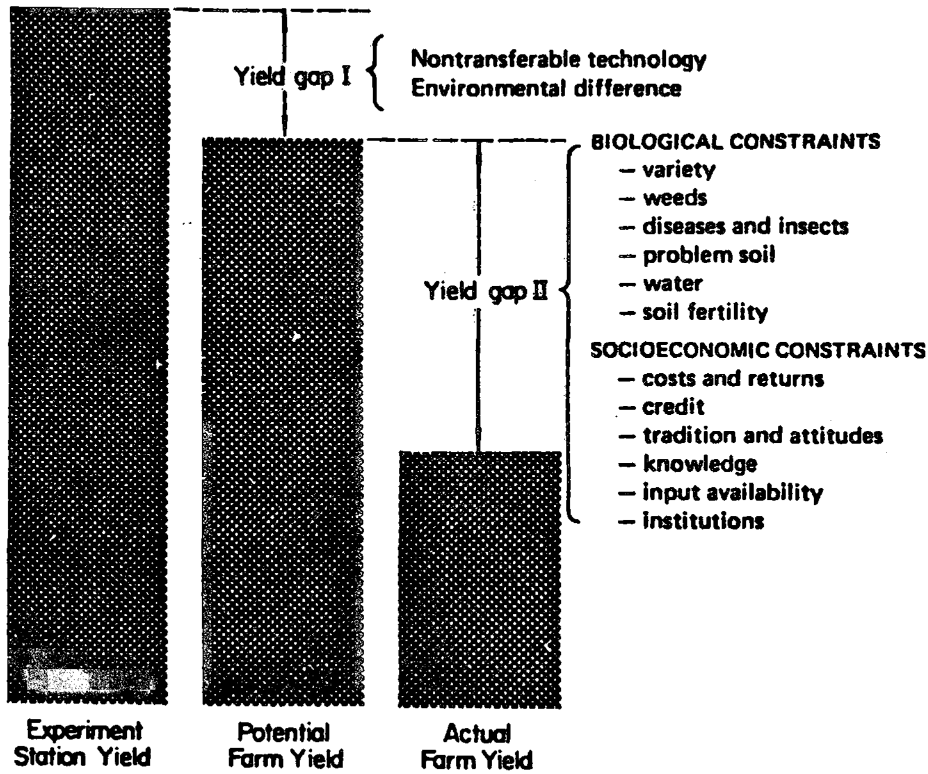
Agricultural extension is **one** of the instruments for rural development. Without the remaining development apparatus, it often contributes little to the dynamic process of development. This is often overlooked and extension is put into practice without the necessary complementary development instruments. As a result, project failures were widely ascribed to the ineffectiveness of the extension system. Mosher (1966:60-180) mentions five **essentials** (market for farm products; constant supply of technology; local availability of supplies and equipment; production incentives for farmers; transportation); and five **accelerators** (education for development; production credit; group action by farmers; improving and expanding agricultural land; national planning for agricultural development) of agricultural development. These factors place the role of extension in a perspective. A recent book review points out the importance of Mosher's (1966) contribution, as it allows us to understand that extension will usually only be effective if it is combined with other policy instruments (van den Ban: 1988). In fact, extension cannot do the job alone. Present extensionists describe this comprehensive context as a **development mix** (Haverkort and Röling:1984:12). The development mix refers to the necessary conditions which must be fulfilled in a historical situation to get agriculture moving. It includes services such as credit, insurance, input supplies, transportation, marketing, processing and storage of agricultural products, seed multiplication, soil improvements, irrigation etc. Further, it includes legislation and regulation which facilitate agricultural development such as land tenure, land reform, co-operatives, quality control, taxes and subsidies. The development mix is an extended version of Mosher's essentials and accelerators. The importance of the mix varies with the historical situation. If prices are too low to provide a good incentive to farmers, extension is a useless instrument. However, as farmers gain more and more control over the elements of the mix, the role of technology and extension becomes more and more important, and agriculture becomes technology propelled.

In many developing countries, and specially for small farmers and less potential areas the conditions of the mix are not fulfilled. In such cases, reliance on the 'transfer of technology' as an instrument of agricultural development has relatively little effect. Long (1984:23 af) has emphasised that technological innovations should be treated in relation to other necessary requirements. As an example, technical change by itself may not stimulate production unless there is a viable system to provide other elements of the development mix. Extension in developing countries is often not rewarding professionally and stands below research in both funding and trained staff. Comparatively, extension suffers from low levels of education, salary, per diem allowances, and motivation. It has less in opportunities for formal and non-formal training and in professional or civil service advancement (Galt and Mathema:1986). Even today, such factors are not taken into consideration.

Another way to illustrate the need to look at extension as an integral part of a 'mix' has been provided by Gomez (1977:02), who has developed a conceptual model to explain constraints associated with the yield gap. A considerable gap exists between the potential yield and the actual yield. Fig. 6.3 shows the constraints farmers face in realizing their potential yield. These constraints cannot be overcome only by paying attention to technology development and transfer. Other policy instruments must be deployed to remove the other constraints in the farming environments. Extension workers can be called upon to pay an active role in this, say by distributing fertilizers, filling credit application forms, etc.

Agricultural extension may appear in different forms and its objectives may vary, depending on the situation where it is deployed. When the other elements of the development mix are available, extension can be confined to knowledge dissemination. This explains the emphasis on **extension exclusiveness** in the extension management system advocated for the T&V model. However, in developing countries, the other factors in the development mix are often not provided at all or inadequately. In these circumstances, knowledge dissemination **per se** does not fulfil the requirements needed for agricultural development. Hence, firm measures should be taken to provide the pre-requisites for agricultural development,

Figure 6.2: Conceptual model explaining constraints for yield gap.



Source: Gomez:1977:02

before launching an extension approach or the extension approach should incorporate the elements in the development mix. Two extremes may, therefore, be identified in the evolvement of extension approaches. First, extension exclusiveness, and second, extension which caters for the elements required in the development mix. In fact, many extension approaches fall in-between these two limits and no standard extension approach obviously fits all situations. It is, therefore, important to carefully select the most appropriate extension approach. In the next section, different extension approaches which account for the development mix will be discussed.

6.4 Extension approaches

An extension approach is an organized and coherent combination of strategies and methods, designed to make agricultural extension effective in a certain area. Extension approaches can be regarded as policy alternatives for governments. The question is how to combine extension with other policy instruments so that farmers can assemble the 'mix' they require at the farm level. Haverkort and Röling (1984:12-34) have identified six extension approaches which are commonly being used in developing countries.

6.4.1 The scheme approach

The distinguishing feature of the scheme approach is that all the decisions are taken by one management, as in the case in plantations, nucleus estates with outgrowers, settlement schemes, or irrigation schemes. Hence, the assembly of the development mix is controlled by one authority. Experience shows that this approach can be used to extract wealth from rural areas. It usually pays little attention to rural welfare. Further, it uses a top-down flow of communication so that the intervener enjoys freedom to impose his wishes. The tenants usually do not have countervailing power. The farmers often become paid labourers. In all, success depends on the quality of the management and the goals of the scheme. A well-managed scheme seeking to increase rural incomes may be an excellent tool for rural development, especially if it creates employment opportunities for landless people. The scheme approach sometimes runs into serious problems if the rules and regulations are not in line with farmers' wishes and instruments for control are faulty, as is usually the case. The 'Gezira' scheme in the Sudan has become a famous example of the scheme approach. It provides irrigation facilities for 96,000 small holders to cover 862,000 ha. A case study found several shortcomings in this large irrigation scheme, however. The cost of supervision and mechanization are very high. Land use patterns seem very rigid. Tenants are inclined to employ labourers and become miniature landlords. Finally, production under closed supervision becomes increasingly unpopular (Ruttenberg: 1980:231-241). There is constant friction between the objectives of the state requesting farmers to grow high quality cotton as cheap as possible to allow the greatest gain for the country on export markets, and the objectives of the grower who would rather maximize his income by growing high value crops.

6.4.2 The commodity approach

The commodity approach is concerned with growing one crop, most probably a cash crop. All the necessary inputs are provided by the management of the commodity organization. Further, marketing and prices are also well controlled. The role of extension is to provide advice on technical, administrative or commercial aspects of the commodity. Extension is given the responsibility for supplying inputs and planting materials, controlling quality, ensuring uniformity, etc. Much attention is paid to ensure the assembly of the development mix at the farm level, but farmers usually remain responsible for decision making at the farm level. A Board or Authority governs the total operation and each farmer deals directly with its management. The major disadvantage is that the farmers often have little countervailing power over the authority responsible for providing inputs, which easily allows corruption and other forms of disparity. Further, this approach also often pays little attention to the local interests (e.g. women farmers, food production, sustainable agriculture etc.). However, there are many successful commodity schemes. Kenya's Tea Development

Authority, for example, has benefited large numbers of small tea holders and generated foreign exchange for the country. The Sri Lankan Tea Board may be seen as a governing authority for the tea crop and its management methodology follows that of the commodity approach.

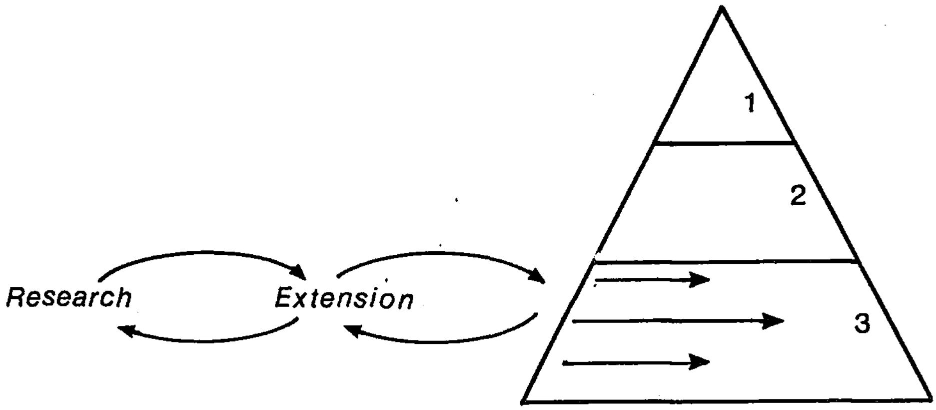
6.4.3 The technical change approach

This approach is the conventional general extension strategy which is extensively used even today. It leaves assembly of the mix to the farmers themselves. Since resource-rich farmers are usually better able to do this, it has rendered benefits mainly to such 'progressive' farmers, while assuming that the impact of the innovation spreads over the farming population through autonomous diffusion. Even though this approach was widely used by many extension agencies, it is therefore often quite inequitable. Generally, the knowledge on the advanced technologies is disseminated to a large number of farmers without much concern for assembly of the development mix. Some technologies may not be appropriate to the majority of farmers' prevailing conditions and the differences in access to resources are often not considered. This approach has, therefore, proved rather unsuitable for poverty alleviation. It can, however, very effective in reaching production targets. This approach can be considered as 'default option' of extension. Unless special measures are taken, extension world over tends to follow technical change approach (Sims and Leonard:1988). It will be further discussed in chapter 7. The T&V system can be considered as a management system for this approach.

6.4.4 The target category approach

This approach aims at deliberately segmenting a farming community into client categories in order to target extension efforts. This approach is basically in line with the methodology which is practised in commercial marketing. First, the extension agency has to conduct a situation analysis to distinguish the local target categories. Second, priorities are determined for each target category. Finally, the type of recommendations and relevant extension

Figure 6.3: Horizontal diffusion within homogeneous target categories.



Source: Röling:1988a:36

messages as well as input 'packages' are designed for the above mentioned categories. That is, before embarking upon extension efforts, significant attention is paid to elucidate differential access of farmers to the development mix. Generally, this approach uses the autonomous diffusion process within well selected target categories. In other words, horizontal diffusion is expected and the adopter categories turn into target categories. Extension offering can be directed more specifically to a particular category of farmers. Fig. 6.4.4 demonstrates this process. A field experiment carried out in Kenya on this strategy had considerable success (Ascroft et al: 1973). More details on this approach will be presented in chapter 7.

6.4.5 The functional group approach

This extension approach tries to establish functional groups first. It forms groups of persons who join their efforts to mobilize the necessary resources to be able to achieve a shared goal, often around a specific activity. The success of the approach greatly depends on the correct formation of the groups. In many rural societies, people are not organized for development purposes and therefore, some external change agent tries to mobilize the leadership to organize them. Röling and De Zeeuw (1983:103-106) have stated five essentials for implementing this approach. They are: mobilization, organization, training, technical and resource support and system management. Development and utilization of opportunities require technical and resource support. Hence, the elements in the development mix play an important role in the functional group approach. But groups of local people are capacitated or empowered and join forces to 'pull down' required elements of the mix. The main thrust of extension is process consultation rather than expert consultation. That is, the focus is on developing leadership, group decision making and so on and not on providing external information. Young farmer clubs, womens' organizations and vegetable-growers' societies may be mentioned as examples for this approach. This approach is usually followed by non-governmental agencies and not by government organizations. One could argue that a focus on providing external conditions for technical innovation and a focus on empowering local groups for innovation complements each other very well.

6.4.6 The farmer-organization approach

In this approach, independent, self-managed and permanent organizations are formed to achieve social or economic development of the members. The members themselves form these organizations, but they may ask advice from extension agencies. Sometimes, farmer organizations establish their own extension units. Farmer organizations are formed through the strength of the members and not through an external agent. Success of this approach greatly depends on the collective effort of its membership. Further, it requires a high degree of mobilization and management skills. The elements in the development mix are mostly fulfilled through the collective effort of the membership. The problem often is that they lose contact with their own membership. Farmer corporations and credit societies are examples of this approach.

Chapter 7

EXTENSION COVERAGE

7.1 Small farmers, a target group for extension

As a primary national goal, countries seek to ensure adequate food supply. Different policies have been adopted by different countries to achieve this objective. Their success has varied to a high degree. In achieving food security, developing countries have often not paid much attention to the vast majority of small scale farmers (Andrew: 1984). Hence, even though the national production in developing countries has shown positive trends, almost all developing countries are experiencing inequitable development, and widening socio-economic gaps in their rural communities. Projects with an urban bias have made development needlessly slow and unfair. Resource allocation between the city and the village reflects urban priorities rather than equity or efficiency (Lipton: 1980: 13). Moreover, resource allocation seems to be highly imbalanced between the rich and the poor. This has greatly affected the existing productivity differences between the large and small farmers. It has been argued that the food problem of developing countries is a distribution problem rather than a production problem (Röling: 1976: 05). Therefore, the only way to overcome the problem is to formulate policies towards more equitable development.

Poverty problem in rural areas revolves mainly around the productivity and incomes of small farmers. In the world the great majority of the absolute poor, 90 per cent, consists of people who work on farms or are involved in part-time agriculture. More than half are small farmers. Another 20 per cent do collective farming. The remaining one-fifth to one-quarter are land-less, and their livelihood is particularly precarious (World Bank: 1982:79). It has been estimated that more than 50 million farm families cultivate less than one hectare (McNamara: 1975: 14). Between one-fifth and one-quarter of the people of the world are overwhelmingly rural, landless labourers or farmers with no more than one acre (0.4 ha) or two (0.8) (Lipton: 1980: 15).

The dramatic technical change, popularly known as the 'green revolution', which has taken place in agriculture has undoubtedly offered benefits to the whole population in those countries where it took place. But rapid increases in production and reduced prices of agricultural products have also reduced real incomes of farmers with low access to resources such as irrigation water and land and of farmers in marginal areas.

We do not have to further belabour the point here. What is important is the realization that the rural poor, who make up a large proportion of the population in any developing country, are an important target category for agricultural extension for the time to come. Unless they are helped to become more productive and unless their purchasing power is increased, one can hardly speak of 'development'. Practical issues are the prevention of further mass migration to already congested urban areas, the prevention of further destruction of productive resources, the creation of mass markets for consumer goods, and so forth.

As a group, small scale producers can, therefore affect the national economies of developing countries substantially. They form a substantial production and consumption category. Moreover, although their proportion in the total population might decrease, but it seems unlikely to decline in absolute numbers in the foreseeable future.

Fortunately, it is now more widely recognized that development efforts should be designed to assist the small farmers more effectively. Promising strategies to reach small farmers, such as targeting of technology development and extension methods, FSR, farmer participation in research etc., are not as yet widely adopted. The problem is in the stage of general lip service. More misery and ecological and human degradation and political disaster will probably be required to make the problem to serious priority.

7.2 Past extension efforts: Neglected small farmers

During the past two decades, agricultural extension has gained ground in development programmes. As one of the development instruments available, extension services have made various efforts to reach the rural population within the framework of national development goals. However, most of the extension approaches have been concentrated on small numbers of progressive farmers in order to achieve national food production objectives as fast as possible. This approach has shown considerable success in many developing countries, leading to significant increases in total production. But it often has had an adverse effect on small producers. 'Progressive farmer' approaches often contributed to an increase in disparities between farmers (Röling et al:1976). There is a strong case for saying that government extension services have not been aimed at the poor sector of farmers (Hunter: 1981: 16). The following examples illustrate the point.

In Kenya's Central Province, extension efforts concentrated on the progressive farmers. But those were successful in raising the productivity of only 10-15 per cent of the farmers (Adams: 1982: 49). In India, several institutional arrangements have been made to help the small farmers to adopt improved farm technology but farmers' responses have been quite insignificant. It has been recognized that the benefits of the improved technology accrued mostly to the large farmers due to the fact that the resources needed for the adoption of new technologies were only held by them (Jaiswal and Srivastava: 1976). In a nutshell, within the context of past national food production goals, in many developing countries agricultural extension approaches were designed to serve a small category of farmers, but not the vast majority. The Transfer of Technology (ToT) model led scientists to determine research priorities, develop technologies in highly controlled conditions and thereafter pass them over to agricultural extension to disseminate to the farmers. This strategy is very much out-put oriented and does not make room for client-oriented programmes. In a nutshell, scientists develop a product and extension offers it to farmers (Chambers and Jiggins: 1987). Extension programmes based on such a strategy have seriously neglected the needs of the resource poor small farmers. Therefore, **extension coverage** has been highly imbalanced. Extension coverage refers to the extent to which farmers in a category of community are reached with equal frequency and regularity by an extension agency.

Sri Lanka, too, has encountered similar problems while implementing her development efforts. As mentioned earlier, the economy of Sri Lanka largely rests on agricultural production. The agricultural sector contributes one-fourth of the country's GDP (Central Bank: 1985a: 01). The rural sector holds 79 per cent of the total population (Department of Census and Statistics: 1986: 21). The staple food crop, rice, as well as other subsidiary food crops, are produced in the rural sector but food production was neglected to a great extent till independence in 1948. Not only does the total responsibility for food production rest on this sector, but it has to act as a holding ground for unskilled labour since alternative employment opportunities are severely limited. Hence, it is not an exaggeration to point out the vital need for its urgent improvement. This is a known fact and numerous efforts have been taken to improve the rural sector since independence. However, the majority of agricultural producers has not been able to improve its standard of living. It is evident from a Sri Lankan study that the distribution of benefits following the introduction of high yielding varieties was highly inequitable (Hameed et al: 1977: 117). Furthermore, the study illustrates that small farmers with a low capital structure were incapable of benefiting from the modern technology and mostly, the benefits were enjoyed by the farmers who have holdings greater than 2.5 acres (1 ha).

Past extension programmes followed the line of the conventional approach, limiting the benefits to a small number, as in many other developing countries (Ratnayake: 1982: 01). In some instances, extension efforts have been concerned about small farmer problems, but the solutions implemented seem to have been highly insufficient. Small farmers' problems still prevail to a great extent.

7.3 Implications of the conventional extension approach

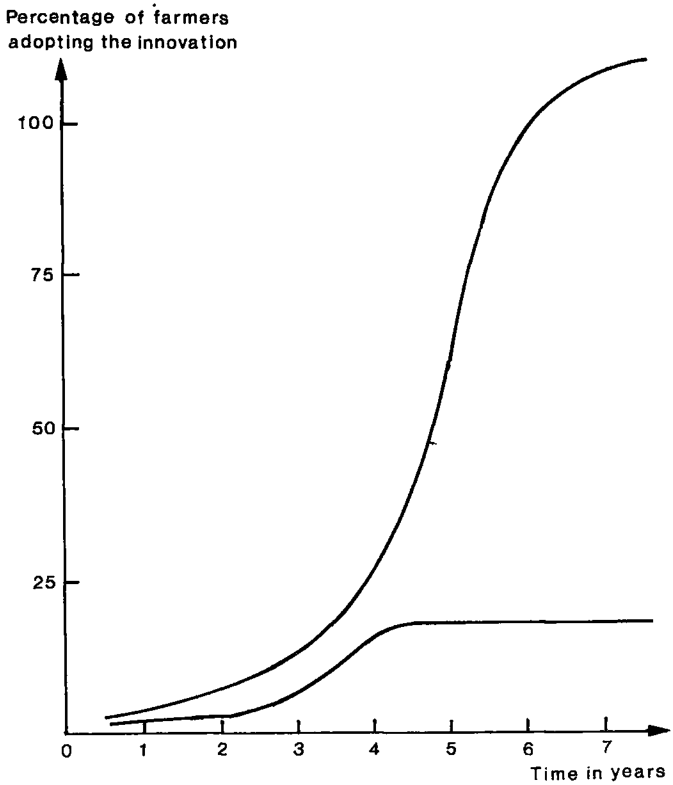
It is evident that, so far, extension efforts mostly have been based on the conventional diffusion model, the technical change approach or 'default option' we discussed in chapter 6 (Adams: 1982: 49, Ratnayake: 1982: 01). Diffusion is a process by which an innovation is communicated through certain channels, over time, among the members of social systems (Rogers: 1983: 05). Diffusion in agriculture is regarded as the process by which an innovation spreads among the farmers until all farmers for whom the innovation is relevant have adopted it (Mosher: 1978: 46). The diffusion strategy implies that the individuals in a social system who have adopted an innovation influence those who have not yet adopted (Rogers: 1983: 33). Using a hybrid corn example, Rogers (1962: 215) has argued that 'demonstrated success of the hybrid seed on a few farms offered a changed situation to those who have not been experimental'. The assumption made is that acceptance by one or more farmers gives a new stimulus to the remaining ones. This concept provided a firm base for the formulation of an agricultural extension approach which focuses on the **most successful or progressive farmers** in the community. In this context, progressive farmers were identified as 'progressists', 'lighthouses', 'experimentals', 'opinion leaders' and so on, in different situations.

The diffusion process typically follows an S-shaped curve. At first, only a few individuals adopt the innovation, the so called innovators. The diffusion curve begins to climb, as more and more individuals adopt. Then the trajectory of the rate of diffusion begins to level off, as fewer and fewer individuals remain who have not adopted yet. Finally the S-shaped curve reaches its asymptote and the diffusion process is completed (Rogers: 1983: 23). This model, it must be said has been based on ex-post studies of successful diffusion processes. It cannot be used ex-ante as many innovations never take off.

The conventional agricultural extension approach uses the diffusion model by delivering innovations to farming populations by utilizing innovative or progressive farmers as the contact point for the external source. The assumption made is that the innovation will **trickle down** from the progressive farmers to the rest. This supposition is attractive, especially to administrators in developing countries, since they are confronted with the problem of serving vast numbers of small farmers with limited numbers of extension workers. For the change agencies, this model seemed to provide a conceptual framework for the formulation of cost-effective extension programmes in which they had only to deal with a small number of successful farmers (Röling et al: 1976).

However, agricultural extension, so promising of improving productivity and efficiency through greater adoption of new practices, seemed nevertheless to fail to make a significant impact on subsistence farmers in the rural Third World. The adoption rates in the developing countries usually failed to produce S-shaped diffusion curves covering the whole farming population, particularly in traditional rural areas. Where completion of the S-shaped curves was approximated, it was only in rural areas which were modern in their outlook and approach to agriculture and had a high access to resources. In less well-endowed rural areas, adoption rates were very low, producing truncated S-shaped diffusion curves (Rogers: 1969: 293). Fig. 7.3 shows that the diffusion process is just not an

Figure 7.1: Completed versus truncated diffusion curves for same innovation.



autonomous process which will ensure trickle down of innovations from one farmer to another until all the members of the population adopt the innovation. By assuming such automatic trickle down, agricultural extension has made significant errors in the past.

Presently, it has been recognized that the progressive farmer approach has not benefited the small farmers (Adams: 1982: 49); the advantages of new technology have been enjoyed mostly by the large farmers (Jaiswal and Srivastava: 1976); distribution of the benefits has been highly inequitable (Hameed et al: 1977: 117); and further, the approach has had an adverse effect by widening the **socio-economic gaps** between the progressive farmers and the less advantaged group. It has been found that a project designed to disseminate information from progressive to non-progressive farmers has ignored 80 per cent of the farmers in Kaduna State, Nigeria (Monu: 1983). It shows the failure of the trickle-down theory. Technological innovations were developed and transferred to all the members of a social system assuming that these innovations are advantageous to all of them. This is called the pro-innovation bias (Rogers: 1983: 92). However, especially with the small farmers, the innovations were often ill-adapted and further, this pro-innovation bias acted as a limiting factor to the improvement of traditional practices which were relevant and compatible with farmers' conditions and resources (Melkote: 1984: 19).

7.4 Variables associated with innovativeness

Innovativeness or progressiveness is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than the other members of the system (Rogers: 1983: 22). Progressiveness has been explained in association with socio-economic, personality and communication variables (Rogers: 1983: 251). These generalizations were taken to mean that progressive farmers are marked by certain characteristics which reinforce the diffusion process. Early studies paid much more attention to psychological variables to describe progressiveness (Röling:1982:95; Rogers: 1983). Psychological explanations permitted change agencies to assign 'person blame' to the small farmers for not accepting their recommendations. Further it was argued that small farm size or low output was due to the negative psychological characteristics of the small farmers themselves. Considerable amounts of research have been done to determine the socio-psychological factors or 'in the head' factors which could inhibit the diffusion process. This body of research gave rise to theoretical generalizations on the socio-psychological and personal characteristics of the peasant. At this stage agricultural extension shoulders the burden of devising strategies to overcome these socio-psychological constraints (Melkote: 1984: 10). Ascroft et al (1973) have pointed out that this was a daunting problem because the variables in question are essentially non-manipulatable. Hence diffusion failures were many, but change agencies simply transferred their shortcomings to the non-adopters by blaming them, instead of looking for more effective approaches.

7.5 Access to resources

Today, it is more often argued that progressiveness can be better explained by socio-economic variables, especially by the **differences in access to resources** such as land, water, labour, inputs, markets and information (Röling: 1982: 95). Farmers are not similar with respect to resources, hence an innovation is not equally relevant to all farmers in the same ecological zone. This argument implies that the farmers who hold relatively more of these resources, have much greater chances of adopting innovations than others and, in most instances, they are the progressive farmers. Therefore, it has been hypothesized that constraints to non-adoption were not located inside the heads of farmers but in their environment. Not only the characteristics of farmers, but also the deployment of resources determine the outcome of development (Röling et al: 1976).

In the search for alternative strategies, this marked a turning point. External bottlenecks or limitations to access to resources are now seen as significant variables which affect the diffusion process. The bottleneck, especially for small farmers, is now perceived to exist more explicitly in the system than in the widely alleged 'ignorance', 'passiveness' or 'traditionality' of the farmer. There are strong implications that small farmers remain low producers more because they lack the requisite means of production, than because they are unwilling to adopt technical innovations (Leagans: 1985). Small farmers can be highly productive and often their production capacity per acre is higher than that of large farmers despite the disadvantages of limited access to resources (World Bank: 1982: 91). The experience is that small farmers are quick to grasp realistic opportunities. The time for new extension strategies had come. There focus was not so much on introducing innovations, but on creating appropriate opportunities.

7.6 Social marketing

A fundamental error of the diffusion approach was treating heterogeneous farming populations as homogeneous categories. In fact, the assumption of homogeneity of the target population is a very important aspect underpinning this strategy. Homogeneity of the social system is indeed a necessary condition for diffusion (Röling: 1988a: 112-123). The problem is that farmers differ in access to resources, life cycle, readiness to change many other aspects. They can not be considered as a homogeneous category.

An experiment carried out in Kenya shows that, **given an appropriate technology**, the so-called 'laggards' adopt the recommendations, so that every farmer has the potential to be a progressive one (Ascroft et al: 1973). Therefore, once appropriate technologies are targeted to well-defined target categories, better results can be obtained. Target categories should be carefully identified and analysed so as to develop research and extension activities appropriate to each category. At this point, it becomes evident that market research and practice has much to offer agricultural development. Especially Kotler's (1985) book on 'Marketing for non-profit organizations', has provided a wide audience with an understanding of how marketing principles apply.

Marketing is defined as the analysis, planning, implementation and control of carefully formulated programmes designed to bring about voluntary exchange of values with target markets for the purpose of achieving organization's objectives. It relies heavily on designing the organization's offering in terms of the target market's needs and desires, and on using effective pricing, communication and distribution to inform, motivate and service the markets (Kotler: 1985: 06). Ministries of agriculture and their research and extension departments can typically be regarded as **non-profit organizations**.

designed for, and delivered to, pre-identified homogeneous target markets. In this respect, Röling (1988a) has pointed out significant reasons for the heterogeneity between farmers which are relevant for extension and has been suggested that differences in access variables can be utilized as a basis for categorization. Implementation of this approach does not mean that rejection of the diffusion strategy. Rather it utilizes that concept in each of the homogeneous segments of the population in such a way as to improve extension coverage.

7.7 Farming systems research

The Farming Systems Research (FSR) approach comes close to the concept of 'market research' to identify and test 'products' for target categories. It identifies research priorities according to the actual needs of the homogeneous categories of farmers (Ryan and Binswanger: 1979: 57). Further, it works with specified client groups in the development of new technologies (Biggs: 1985). Many FSR programmes make efforts to develop technologies according to homogeneous agro-ecological environments (Kumble: 1979). However, the heterogeneity of resource endowments within the agro-ecological region has made technology design a difficult exercise (Ryan and Binswanger: 1979: 58). Not only the agro-ecological environment, of the farmers but also farmers' particular socio-economic circumstances should receive attention in technology development development and transfer strategies (Andrew: 1984: 02). It has been pointed out that there is a need for a research team to define the specific client groups for whom the technology developers are working (Biggs: 1985). Therefore, FSR has recognized the need for homogeneous client groups, called **recommendation domains**, taking into account the agro-ecologic and socio-economic conditions of the farmers. The approach has been expanded to include extension, naming it FSR/E (Farming Systems Research and Extension) (Watts and Claar:1983:11). In the process of developing and maintaining an extension programme, farmers themselves must also play a larger role in planning, implementation and evaluation (Lowdermilk: 1985). In general, it has been pointed out that programmes in which local people have played a significant part both in planning and execution will be more effective and successful than centrally devised schemes (Hunter: 1981: 04).

FSR implies a re-orientation of agricultural research and extension. Most FSR programmes, however, pay most attention to research focusing its technology development on the solution of farmers' problems. In many instances, farming systems research programmes have not granted much attention to the knowledge dissemination component. Moreover, farming systems research programmes usually emphasise **agro-ecosystem analysis**, while it is clear that the farming system comprises complex interactions among agronomic, physical, economic and social factors. So far, the concepts of marketing and the practice of FSR have not penetrated much into mainstream agricultural development practice.

7.8 T&V system and extension coverage

Although the T&V system is widespread in developing countries today, it has been subjected to criticism from many directions. Proponents and opponents have brought forward a significant number of views and arguments. However, many criticisms were not based on empirical research. In this section, an effort is made to review the issues and evidence with respect to the extension coverage of the system. Supported by past research and experience, this review will provide the conceptual base for the research problem focusing on coverage. In chapter 9, the results of the empirical study in Matara will be presented.

The T&V system is regarded as a hierarchically organized and time-bound structure designed to deliver selected, timely and feasible technology to the farmers with strict regularity (Feder and Slade: 1983: 02). Further, it has been pointed out that the T&V system is not a new extension model but that it attempts to improve the effectiveness of the conventional agricultural extension system by scheduled training and visits (Swanson and Claar: 1984: 08). It is highly regarded as a time management tool, rather than as a new extension approach (Moris: 1983: 17). However, it has been pointed out that recent development in agricultural extension in developing countries is due to the widespread adoption of the T&V system by them (Howell:1982:01). As the system increases the effectiveness of the extension organization, in turn it will influence agricultural production. Many research studies have shown that total production has increased significantly, after the implementation of the T&V system (Benor and Harrison:1977:03; Mehta: 1983:35; Department of Agriculture: 1985: 02). However, there are not many empirical studies which analyze its impact on small farmers. If increase in small farmers productivity fails to be affected by the implementation of the T&V system, its ultimate impact may be similar to that of the former conventional progressive farmer approach. Presently, the T&V system is being introduced with financial backing from the World Bank (Benor and Baxter: 1984: vii). In fact, due to this incentive, it has some advantage over other extension approaches (von Blanckenburg: 1982b). Hence, in addition to its favourable consequences for aggregate output, this financial support has reinforced its rapid expansion over a short period. Further, as most of the developing countries as well as the World Bank have urged the need for reform in agricultural extension systems, the T&V system has become a popular choice. As the World Bank is the most important donor organization for many third world countries, its wishes influence the decision making process of those countries to a great extent.

7.8.1 Production capacity

The first objective of this study is to find out the extent of extension coverage under the T&V system. As described earlier, there is evidence that the system has, in general, influenced total production. But we have yet to ascertain whether the T&V system is really addressing small farmers' problems. If not, it is essential to find out the manipulatable factors for improving the system. A study carried out in Sri Lanka shows that 32.4 per cent of the CFs have obtained a paddy yield over 80 bushels (1600 kg) per acre while only 13.8 per cent of FFs have recorded that figure (von Blanckenburg et al: 1980: 14). Moreover, even though the national rice production figures have shown significant differences, when the output from major schemes, minor schemes and rainfed conditions were analyzed separately, there was no significant difference in yields between the two time points (79/80 Maha and 81/82 Maha seasons) analyzed (Wijeratne: 1984: 75). An experiment conducted in the Philippines revealed that CFs have achieved 20 - 25 per cent higher rice yields than non-CFs (Nagel et al: 1983: 134). Further, Feder et al (1985b: 33) have provided valid evidence strengthening the above observation by demonstrating that yields in farms that rely on extension workers are relatively higher than the rest.

7.8.2 Bias towards innovative farmers

At its introduction, the T&V system selected progressive farmers as contact farmers. However, it is now widely realized that they are not typical of the farming majority. Therefore, the criteria for selection should allow inclusion of representatives from all categories in the group of CFs (Swanson and Claar: 1984: 09). Data suggest, however, that CFs tend to be selected from the larger, more educated and wealthier farmers. This bias may be appropriate since CFs are desired to be fast adopters with opinion leadership potential. Whatever be the case, the differences between CFs and non-CFs are statistically significant for a selected set of variables (Feder and Slade: 1983: 22). CFs have undergone more agricultural training, and have more memberships in village institutions, compared to non-CFs. Moreover, the selection of CFs is biased in favour of the tube-well owners (Feder and Slade: 1984: 11-12). Recalling that innovations do not trickle down from the top to the bottom but, rather, that diffusion process will take place between farmers who are homogeneous in access and other variables, it is hard to expect an effective extension coverage of all farmers in a community when CFs are significantly different from their presumed peers, especially in terms of access to resources.

7.8.3 Interactions

In the T&V system the Village Extension Worker (VEW) is expected to respond to all farmers who approach him with queries (Benor and Baxter: 1984). Therefore, in this context, one of the critical indicators will be the intensity of extension contacts. An Indian study has discovered that for CFs, not-seeing of the extension agent ranges from 1.2 to 34.7 per cent while for non-CFs it ranges from 21.4 to 59.2 per cent for the reference period (Feder et al: 1985b: 08). The same study has examined the trends in extension contacts related to the experience with the T&V system. Results demonstrate that the proportion of CFs not visited goes up significantly as project age progresses. Amongst the projects which are four or more years old, one in five CFs were not visited. However, in contrast, the proportion of non-CFs 'no visits' has declined (Feder et al: 1985b: 14-15). Explanations provided by the authors suggest that in the first case, the increase in 'no visits' for CFs was partly due to the replacement of CFs. In the second case, decrease in 'no visit' for non-CFs was due to the increased number on regular extension visits.

The frequency and regularity of extension agents' visits have been examined by the same researchers. The results show that 80 per cent of CFs and 20-25 per cent of FFs have received at least one visit per month. Moreover, 30 per cent of CFs and 73 percent of non-CFs, who had visits in the reference period, reported irregularity in visit days. In fact, the intensity, or frequency and regularity of village extension worker's visits are important variables by which extension coverage can be evaluated.

In the T&V concept, CFs are supposed to make the bridge between the extension service and the farming community and further, they are expected to act as local catalysts. According to the formal T&V framework designed for Sri Lanka, CFs represent 10 per cent of the rice farmers. They are expected to make the contact point to the outside source and at the same time they are supposed to keep close interactions with the rest — the 90 per cent non-CFs. Generally, each CF is assigned 21 non-CFs.

His main duties are two fold. First, for these non-CFs the CF is supposed to pass the extension messages which are being continuously delivered by the extension service. Second, he should convey the farmers' stress points to the extension service for solution. Hence, the interaction between CFs and non-CFs is also an aspect which determines the effectiveness of extension coverage. A recent Indian study has demonstrated that only 22 per cent of the CFs can be labelled as CFs in the right sense of the term, in that they played their role as expected (Ingle et al :1987). In one study, 26 per cent of the non-CFs are unable to name their respective CFs (Nagel et al: 1983:139). A number of studies in Sri Lanka provide interesting information. Hindori and Renselaar (1982:21) have revealed that 38 per cent of the FFs are not aware of their respective CFs. Sivayoganathan (1980) has demonstrated that extension messages were not sufficiently communicated to the majority of farming community as approximately three-fourth of the farmers stated that only upto 50 per cent of the CFs really cooperate in the transfer of messages to FFs. Another study of the same author (1985) suggests that approximately two-third (63%) of the FFs seek information from KVSs and that only 11 per cent of the FFs rank the CFs as the first source of information. It has been demonstrated that the CFs were not fully conversant with their function and role and further, the other farmers were still dependent on the KVSs (Gunawardena and Chandrasiri:1981:14).

The review provided above gives an insight in extension coverage in the T&V system. Furthermore, it reinforces the need to analyze extension coverage of the T&V system especially, as we now understand that, in most instances, there is a wide gap between the formal T&V system and practice. Therefore, chapter 9 will empirically investigate extension coverage under the T&V framework, using the case of Matara.

Chapter 8

INFORMATION FLOWS

8.1 Concepts and Definitions

8.1.1 Perspectives

The conventional Transfer of Technology (ToT) model implies that research generates knowledge, that extension takes up the delivery function to transfer the generated knowledge and finally, that farmers utilize it to improve their production. During the past, specially in developing countries, a considerable amount of investment was allocated to implement agricultural development programmes based on this strategy. In fact, such investments often were a marked success in terms of increasing total food production. Many developing countries are now experiencing an overproduction of food grains, even though poverty affects the majority of the population. The ToT model focused its efforts on resource-rich farmers and high potential areas. As we have seen earlier, problems confronted with resource-poor farmers and low potential areas are partly due to allowing well-off farmers and high potential areas to capture an ever increasing share of the limited market for agricultural products. The question raised with respect to the TOT model lead to questions regarding the roles of research and extension and their institutional interfaces. Usually, agricultural research is regarded as the source of new technology, both software and hardware, which is transferred by extension to farmers. Research and extension are considered as two separate institutions. Their 'linkage' serves to pass on technology to extension. That is the popular view according to the TOT model but this view is now severely challenged. Presently, research, extension and utilizers are regarded as three major components of one system, the Agricultural Knowledge System (AKS). The AKS paradigm is increasingly receiving attention as it can be used as an a tool for analysis, design and system management (Röling: 1988b). I shall return to AKS later in this chapter.

Knowledge dissemination is used in this text to mean the transfer of knowledge on an agricultural innovation or an agro-technology. In fact, often the terms 'innovation', 'technology' and 'knowledge' are being used as synonyms, but they are not exactly the same. An innovation is an idea perceived as new. A technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationship involved in achieving a desired outcome. A technology normally has two components; a hardware component, consisting of the tool that embodies the technology as a material or physical aspect and; a software component, consisting of the information on how to use the tool (Rogers: 1983:12). However, there are some technologies which only have the software component but, both, hardware and software dimensions of technology encompass knowledge.

8.1.2 Dissemination

The term 'dissemination' can be defined as the movement of an intact knowledge item from one point to another. The terms 'transfer' or 'diffusion' serve as potential synonyms. However, according to Rogers (1983:05), diffusion is an autonomous process. But, diffusion can also be regarded as an activity when some effort is made to disseminate knowledge or information. I shall call the activity dissemination and reserve the term 'diffusion' for the autonomous process which an innovation spreads in a population. In past and present literature, we frequently find terms such as 'diffusion of innovations' and 'transfer of technology' as if they mean more or less the same despite the conceptual differences. The term dissemination is much used when the knowledge is in conceptual (software) form. Further, knowledge dissemination covers more than diffusion, because a great deal of relevant activities and decisions usually occurred long before the diffusion process began (Rogers: 1986:54). As this study mainly concentrates on the software component of technology, the term dissemination is used hereafter as mentioned earlier.

8.1.3 Knowledge and information

Knowledge has been defined as a set of concepts, meanings, skills and routines acquired actively over time by individuals or groups. Some knowledge is acquired through scientific research, other knowledge is developed through daily practice and testing of generations of people. Next, knowledge is in people and individuals or groups of individuals continuously change and adapt their knowledge to changing intentions, opportunities and circumstances (Engel: 1987b:10-11). Further, knowledge, in the general sense, is the one thing that accumulates among humans, that can be passed from one human to another almost intact and that can be stored from one generation to generation or perhaps for an infinity of generations (Havelock: 1986a:13). Röling (1988a:193) argues that knowledge is an attribute of the mind. In that respect, it cannot be transferred. It is the outcome of lifelong information processing, storage and retrieval going on in the neurophysiological system. Further, the transformation of knowledge depends on whether the information was capable of reducing uncertainty in the mind. According to this conceptualization, an extension system transfers information rather than knowledge. However, a bit of a confusion exists over the definitions of knowledge and knowledge systems as there are many different arguments. Hence, an exact definition cannot be made in the present circumstance, and further, it is not the purpose of this chapter to enter into this argument. However, all agree on the difference between knowledge and information. Beal et al (1986) have provided a good coverage of the subject.

Today, environments are largely man-made and man-controlled. Instead of adaptation to the environment, we are much concerned about controlling the environment. Development and utilization of knowledge can be regarded as a powerful instrument for environmental control (Röling: 1988b:05). Hence, advancement and utilization of knowledge permit greater control of the environment. In the context of knowledge utilization, environment, knowledge, information and data have become key factors. People develop knowledge in relation to the environment. Knowledge refers to cognition, intelligence, mind, a representational and predictive system which allows people to act purposefully. The environment will become data when it is registered on some human instrument or sensory organ. The data can be transformed into information only when some pattern is imposed on the data (Röling: 1988a:192). According to Engel (1987b:13), information constitutes data organized and represented in such a way as to acquire a certain meaning for future action of receivers. The information contains meaningful bits and pieces for the receiver, at least, that's what the producer of information intends. A piece of data which tells us what we already know is not regarded as information (Röling: 1988a:192). Knowledge will be stored in the neurophysiological system and when needed, it will be transformed (encoded) into information. Hence, what we transfer is information. At the receiving end, the receiver will transform (decode) the information into knowledge. This knowledge can be utilized as a tool to make decisions. Despite current arguments and conceptualizations, I take the liberty to use the term knowledge dissemination to mean the same as information transfer in the sense used by Röling (1988a). In all, the processes, of storage and retrieval of knowledge, and information transfer have become important aspects in extension as the following vignette illustrates.

Knowledge storage and retrieval

During the fortnightly training SMOs deliver knowledge (information) to extension workers in the form of messages. It is expected that this knowledge will be disseminated to the farmers within the coming two weeks. However, often the messages are not relevant to all the farmers because they follow different cultivation rhythms. Hence, the knowledge will (hopefully) be stored in the brain memory. When needed, knowledge can be retrieved and transformed into information for dissemination to farmers.

8.2 Dissemination Process

According to the conventional research tradition, technologies and knowledge are developed in experiment stations and are thereafter, passed to the ultimate users. Today it is increasingly recognized that not only research, but also the other elements in an AKS perform knowledge generation. As an example, farmers do engage in their own research. However, the main task of the dissemination sub-system is to disseminate knowledge and information to and from the utilizer sub-system. In many instances, extension organizations utilize the mechanism of serial communication to perform this task. In other words, the message is conveyed through a number of communicators, and mostly the process takes place by word-of-mouth communication. In this process, not only can the message be totally lost or not be transmitted to the appropriate information seekers, but it is also evident that message distortion takes place to a great extent (Pace et al: 1975:84). If the length of the communication chain is increased distortion and losses tend to occur more intensively.

The knowledge gap can be viewed as the amount of information or knowledge contained in the knowledge input but not in the knowledge output. The existing knowledge gap between different steps in the communication chain can be partly explained by the distortion which occurs during the information flow.

Scientists play an important role in the growth of knowledge, but any knowledge acquired should be disseminated to the clients so that it can be utilized for their benefit. Beal et al (1986:03) have pointed out that in terms of quantity, there is no lack of knowledge, but there are enormous problems for acquiring, handling, storing, updating, disseminating and using knowledge. Moreover, Singh (1981:15) has stated that the main problem facing developing countries is not the lack of technologies or scientific knowledge needed for economic development and rural change, but converting them into production, and using them as an instrument. Such conclusions highlight the importance of the transformation and dissemination tasks of extension.

According to the formal T&V, much of the knowledge in the Sri Lankan AKS is generated in research stations. Hence, research can be viewed as the starting point of the dissemination process. The route from research to farmer involves several steps, especially marcating the route through the extension sub-system and farmer sub-system. In the latter part of the knowledge dissemination process, the message transmitted to the professional extension agent through the bureaucratic organinational structure, is handed over by him to a set of untrained communicators for its further dissemination at the village level.

As mentioned earlier, the second research problem of this study is to analyze the process of knowledge dissemination in the context of T&V system of agricultural extension from the point of view of the effects of serial communication. Hindori and Renselaar (1982) and, Sivayoganathan (1985), have undertaken studies in Sri Lanka in the area of dissemination. These studies present an useful contribution concerning the nature of the knowledge dissemination process. But many issues remain unclear. Hence, further empirical research is required to understand how the system works in this respect. Chapter 10 reports such an empirical study.

8.3 Evolution of agricultural knowledge systems

All systems are composed fundamentally of networks of connected entities. Entities can be of any size or description, and they can be defined arbitrarily merely as points or specified spaces regardless of any material referent (Havelock: 1986b:77-78). Röling (1988a:09) has defined the knowledge system as a set of institutions, organizations and/or persons, and their linkages and interactions, engaged in the generation, transformation, transmission, storage, retrieval, consolidation, dissemination, diffusion and utilization of knowledge and information, with the deliberate purpose of working synergically to support decision making, solve problems and/or introduce innovation in a given sector, branch, discipline or other domain. Engel (1987b: 17) describes an agricultural knowledge system as the combination of individuals, groups, organizations and institutions that use agricultural knowledge in a certain delimitated area. Research - Extension - User linkages play a substantial role in the agricultural knowledge system, as they represent the connections between its components. The Farming Systems Research and Extension paradigm provides an example for such connections and interdependencies between the components. The system approach represents an attempt to bridge the gap between the contribution of research and the utilization of knowledge to improve the output from farming systems (Vacharapongpreecha: 1986).

In the analysis, the three components, research, extension and user have been considered as separate, but interrelated sub-systems constituting the entire agricultural knowledge system
(Nagel: 1980:18).

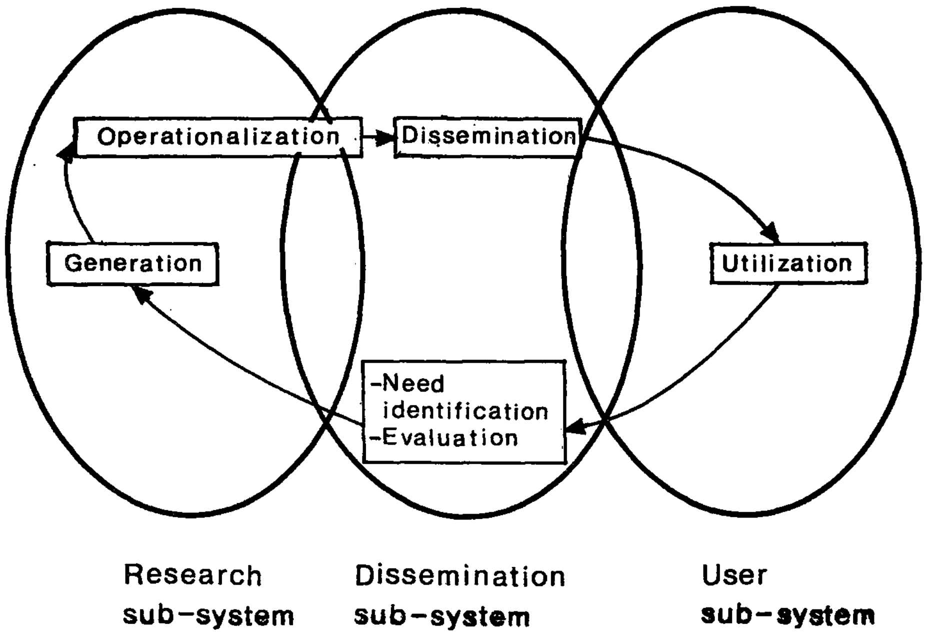
In the traditional view, the research sub-system is primarily responsible for the development of agricultural knowledge while the dissemination sub-system is responsible for transmitting the acquired knowledge. However, recent developments in the field of extension science have explored new dimensions in this respect. I will return to this point later. Finally, the farming community can be regarded as the user sub-system which experiments with the 'offering' under farm conditions and reserves the right of accepting or rejecting the offer. It has been realized that the entire agricultural knowledge system should work towards the third subsystem. In other words, the knowledge acquired within the system has to be directly useful to the farmer and he should be the prime beneficiary (Nagel: 1980:19). The three sub-systems make the connections or linkages by transmitting knowledge or information. Hence, the relationship between the elements of the knowledge system are governed by the nature of the communication linkage

(Haverkort and Engel: 1986:36). At this point it is worthwhile to give an overview of the historical development of the conceptualization of the knowledge system.

The first models confined themselves to forward linkage between three sub-systems. Later backward linkage or feedback mechanisms were built into the AKS model. These forward and backward linkages perform the knowledge dissemination function to a varying degree. In other words, some linkages are strong but some remain weak. The majority of the knowledge systems in developing countries typically demonstrate these characteristics. In contrast, ideally, the three sub-systems should distinguish strong forward and backward linkages to perform an efficient knowledge process. The AKS concept was developed very recently in the field of agriculture by Nagel (1980) on the basis of earlier work by Havelock (1969). Nagel identified six basic functions in order to perpetuate an effective knowledge dissemination process. They are, identification of needs of the users, generation of innovative knowledge, and its operationalization, dissemination, utilization and evaluation. Fig. 8.3 demonstrates Nagel's AKS model. Important contributions to the development of the AKS conceptualization were made by Linberger and Chang (1970) in their analysis of the Taiwan system, the International Programme for Agricultural Knowledge Systems (INTERPAKS) at the University Illinois (Urbana-Champaign Campus) and, Röling (1985, 1988a) and Haverkort and Engel (1986) in Wageningen, where a two-year MSc course in the Management of Agricultural Knowledge Systems (MAKS) was started in 1986. The knowledge system conceptualization seems heuristic and allows linking research in the field of agriculture with research of technology development, transfer and utilization in industry and other sectors.

As work on knowledge system progresses, important improvements to the earlier conceptualization occur. Thus, in addition to farmers, research and extension, education and training institutions, policy makers, private firms dealing with agri-support services, non-profit organizations, and others are now seen as important elements in the AKS. In early AKS models, certain functions were

Figure 8.1: The early AKS model: elements and functions.



Source: Nagel: 1980:34

'confined' to particular elements in the system. Research was seen as responsible sub-system for knowledge generation, extension for transfer and farmers were the utilizers. Today, all the actors in the AKS are regarded as engaged in all the basic processes. The diffusion process does not only take place among farmers, but also among scientists and others. Not only farmers utilize the knowledge generated by the research, but in turn, research utilizes farmers' and other knowledge. Not only research conducts research, but farmers too engage in experimentation.

Farmers do experiment

The Sri Lankan Department of Agriculture introduced a new variety of chillies to the farmers. After few seasons, farmers realized that consumer demand for the pod of this particular variety was not so encouraging. At the same time, farmers discovered a long-pod-type chilly variety in the retail market. Farmers began to use the seeds extracted from this 'unknown variety' in their gardens. They found that there was a promising demand for this variety because the pods could be used as a vegetable and as a pungent. The farmers requested extension personnel to provide pure seeds of this variety as they were using mixed breeding stock. However, the request was not taken up. Farmers then laid out separate plots to obtain seeds for the next season. They selected good plants, pods and seeds — **a farmer's selection** (De Zoysa: 1988).

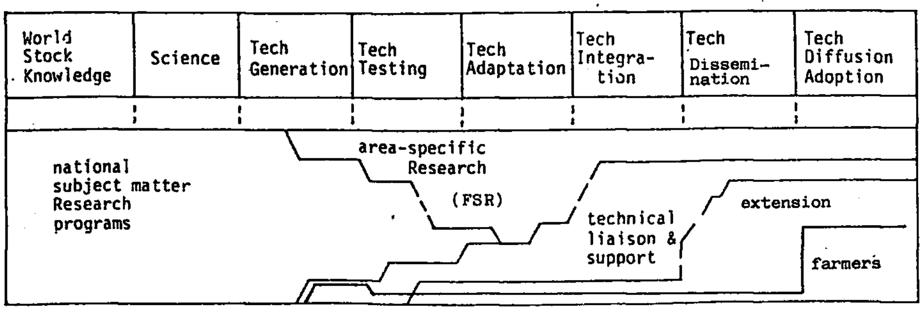
It is now generally accepted that generation of knowledge and information is very much also a farmers activity. However, up to the recent past, scientists were disinclined to accept this. Even now, such acceptance is not easy. The real break-throughs in genetics and other contributions of research in the past, still lead scientists to believe that all new knowledge emanates from research and spreads from them to extension and farmers according to the TOT model. But many of the improvements suggested by agricultural research rest on discoveries and ideas of farmers. Many types of farming even today are not served by research, extension or any other services. Chena cultivation practiced in the dry regions of

Sri Lanka provides a fine example. It is evident that a considerable proportion of the production of subsidiary crops comes from this farming system without the benefit of research or extension. In fact, in many countries, systematic research is not older than two hundred years, but farmers have managed their agriculture for thousands of years through a slow process of development.

Advancement in technology, specially the knowledge generated in the green revolution, accelerated agricultural development. But research (through technology development) has taken control over the future of the farming environment, limiting utilizer control over the development of their farming systems. Further, scientists have the impression that they know better than farmers in almost all aspects of agriculture and that what they do is is best suited to farmers. Such thinking neglects the farmers' knowledge and as a result, farmers are alienated from the decision making process. All the decisions on farmers were taken by policy makers and scientists. Farmers were expected to implement these decisions according to the instructions. This is the essence of the top-down ToT model.

Today, we are more interested in farmer participatory approaches such as farming systems research, participatory methods of technology development, integrated rural development, AKS models, etc. Röling (1988a:14) has pointed out that user control in some form is an essential ingredient for an effective AKS. Another new development in AKS conceptualization is the concern for relationship between the various institutions on the science/practice continuum, on the one hand, and the various functions which must be performed on that continuum, on the other. Fig. 8.3 demonstrates McDermott's (1987:91) **fatal gap assertion**, slightly adapted to show the farmers' involvement. The fatal gap emerges because research stops halfway through the testing process leading to an unfinished product. But testing is not complete unless it is done in the situation in which the knowledge is expected to be utilized. At the other end of the continuum, extension waits till ready-made knowledge is handed over to it. Between research and extension a 'fatal gap' can, therefore, often be said to exist.. Farming systems

Figure 8.2: Profile of involvement in the basic processes by AKS elements.

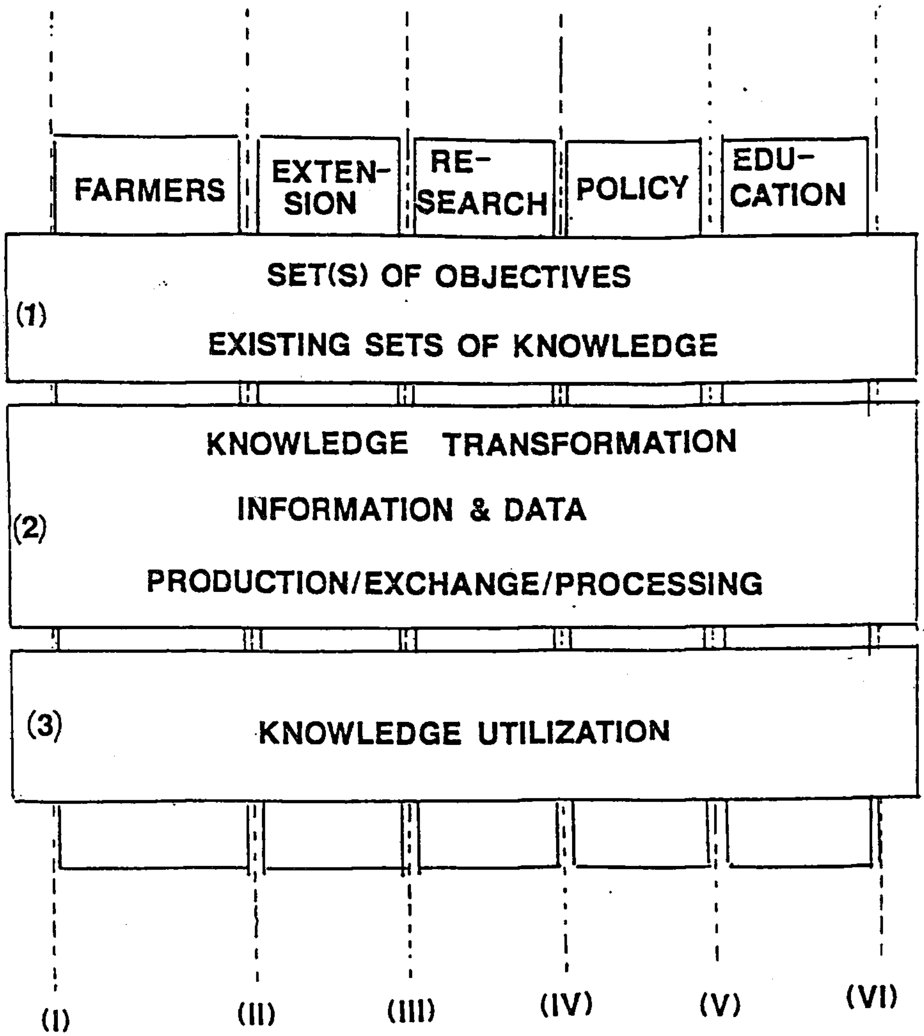


Source: After McDermott: 1987:91

research provides an approach for narrowing the gap by moving research to cover a wider range of activity.

Havelock (1986b, 1986c), Röling (1986a, 1986b) and Engel (1987b:23a) have elaborated the knowledge system concept by highlighting the role of utilizers in the paradigm. I consider them as vital contributions to our understanding and to the future development of AKS. Fig. 8.3 illustrates Engel's model. It allows us to realize that all components of the AKS engage in almost all the processes. On the vertical axis, the components of an AKS are indicated. The horizontal axis represents the functions or processes. Further, I, II, III, IV, V, and VI represent the possible interfaces.

Figure 8.3: New paradigm for AKS.



Source: Engel: 1987b:23a

8.4 Further elaboration of some critical concepts

8.4.1 The focus on 'Transfer'

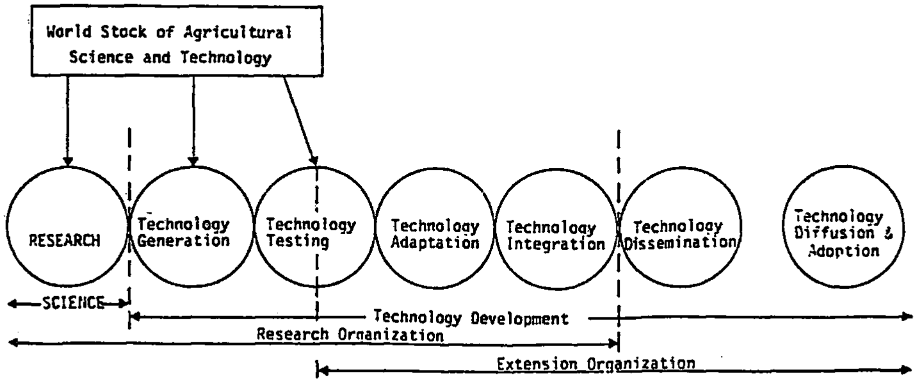
The ToT model still seems to be the most influential AKS model. In the ToT model, researchers are the source of all new knowledge which flows from them to others. It looks that the ToT model will be hard to replace as it has been accepted as the formal corporate model in many of the developing countries. Researchers, are usually the most powerful element inclined understandably to this model. Even when a project started with another concept, it is often seen that ultimately the project shows the features of the ToT model (Ref. vignette in page ???). The ToT model assumes a linear, one-way process, starting from research and ending on the farm.

Fig. 8.4.1 demonstrates the functions of the technology innovation process. It shows that model focuses on the transformation of research to utilizer in a one-way linear process and no attempt has been made to indicate the functions in the transformation from user to research (Röling: 1988b:19). However, the model makes a contribution by clearly distinguishing between the functions of the technology development process. It shows the assignment of responsibilities (functions) to research and extension organizations, but such assignment may leave considerable gaps.

8.4.2 Farming systems research

Farming systems research (FSR) refers to the application of a system perspective in identifying appropriate technologies for area-specific farm situation (Collinson: 1985:71). FSR operationalizes the link between farmer and researcher in the AKS model. Simmonds (1986) has well elaborated the steps involved in FSR. According to Röling (1988b:02), FSR is a participative technology development method to ensure that technology development leads to goodness-of-fit between technology and the utilizer sub-system.

Figure 8.4: The technology innovation process.



Source: McDermott: 1987:95

FSR emphasizes the importance of collecting information from and about farmers in designing technology. Hence, it represents an attempt to introduce an active role for the clients in the AKS. As most of the AKS models are still run on the assumption of a transfer of technology from research to farmers, FSR represents a first step in agriculture to introduce market research as an ingredient in technology development. It focuses on specific target groups — **recommendation domains**. I have discussed this point in the chapter 7. In the ToT model researchers are confined to certain functions with respect to their responsibilities. The FSR extends the research focus beyond this level. The FSR considers the farm as a whole and identifies the key areas where attention is needed. In order to change the existing system most efficiently, it selects the important elements and processes. Further, it tries to liaise the elements in the entire system in a purposeful manner to perform essential processes in the AKS.

In practice, theoretical perspectives do not always work as previously conceived. Recently, FSR has come under criticism for its limited coverage in many aspects. Biggs (1985) has made the critique that FSR is a scientific approach to problem selecting and solving and that it has inadequately considered the resources, and the political and socio-economic environments. Fresco (1985) has argued that it is only an analytical tool but not a development approach. The same author has demonstrated that FSR programmes have a tendency to adopt a single factor approach to intensification, usually by focusing on increasing returns to land through the application of new inputs (1986:38). Fresco's second point is interesting because it draws our attention to FSR's tendency towards the ToT model. In essence, a connection can be made between FSR and its historic forerunners, capital and transfer of technology programmes. FSR's programmatic approach came directly from this heritage and was born and popularized through International Agricultural Centers. The intellectual limitations of FSR's forerunners have been incorporated into its methodological approach (Marcotte and Swanson: 1987). According to Collinson (1987a) FSR requires a team to work together as an on-farm research team, mainly with a production agronomist, farm economist and, where livestock are important, also with a animal production scientist. This has a major implication for research organization: it requires close working relationship between specialist researchers, extension staff and farmers. Box (1987:17) adds that the base of the FSR is the cooperation between social scientists and crop scientists. Hence, in the theoretical FSR model, major elements of the AKS are considered. However, in most FSR programmes, utilizer control over the system is not prominent or unclear. Further, in many instances, principal investigators work in isolation; on-farm research teams are not properly chosen. Hence, general notions of FSR methodology are often not followed in practice. Biggs (1985) has highlighted the need to define a specific clientele for whom the FSR programme is working. The following vignette illustrates an FSR situation in practice.

Whither FSR

One of the key note addresses at an annual FSR/E symposium stressed that, only ten per cent of the presented papers concerned investigations made on the basis of FSR concept; the majority of the research findings were limited to a specific scientific discipline and had not paid sufficient attention to the production complex of the farming system.

In many developing countries, the above often reflects the situation accurately. Here is a classical example. A Farming Systems Research project starts with foreign financial assistance. Foreign experts and local counterparts select areas for investigation. In many instances, locations have a high agricultural potential and have relatively fair research, extension and marketing infrastructure. This bias often leads to exclude rainfed areas and provides a satisfactory environment for conducting research because the investigators get the impression that the rest of the processes of the AKS are smoothly functioning. Further, the experts forget that FSR/E is a multidisciplinary and interdisciplinary approach. The research team does not cover major disciplines. Hence, the project obviously restricts its coverage to one or two processes, mostly to knowledge generation in limited fields (Ref. Fig. 8.3). Processes such as knowledge transformation, dissemination and utilization receive lesser or no attention. Ultimately, the project approximates the ToT model. Researchers enjoy benefits and glory!

8.5 Imperfections in knowledge flows

8.5.1 Reasons for imperfections

In the context of AKS, the connection among different sub-systems occurs through communication linkage. Certain linkages are rather weak, and as a result, the knowledge dissemination process is not dynamic enough to perform the task that is expected. Two major factors are involved. First, the institutional elements in the system are not properly organized or inappropriate to the specific situation. Second, even with a powerful dissemination structure, in many instances, the process shows some deficiencies, when its prime function — transmitting the knowledge or information falls short. Therefore, failures in dissemination systems occur due to their structural or/and functional deficiencies. In this context, one could make an analysis of an AKS on both or one of these aspects. The emphasis here is to focus more on the functional aspects, i.e., on the message flows in the T&V system.

Even in situations where extension effort has been concentrated, extension personnel and farmers have shown insufficient knowledge about recommendations. One major reason for this is that, in many instances, messages arrive in rather incomplete form (von Blanckenburg: 1984). In other words, message distortion takes place in the process of knowledge dissemination. Moreover, research often provides half-finished products to extension. Once the knowledge dissemination process utilizes the system of serial communication, message distortion will occur in the forms of leveling (omission), adding, highlighting and modifying, in addition to the total loss of the knowledge or information (Pace et al: 1975:84). McDermott's (1987:95) linear technology innovation process points to the 'fatal gaps' where possible message loss or distortion can occur.

8.5.2 Imperfections in extension approaches

Loss and distortion of knowledge or information is one of the main imperfections in the knowledge dissemination process. In the conventional progressive farmer strategy, the extension message is first expected to pass from an external source to a set of selected farmers, and then it is assumed that the message will pass from one farmer to the next by mouth-to-mouth communication. Therefore, a multiplying effect will facilitate the autonomous knowledge dissemination process by which finally the extension message will become known to all the farmers. The imperfections of this approach have been discussed in chapter 7. As the above strategy utilizes serial communication in the process of knowledge dissemination, message distortion has become an important issue in the criticism of the approach. Röling (1988a:77) has empirically demonstrated that planting distance for maize had been distorted in 25 per cent of the cases of second hand information (i.e., only one step in a serial communication), leading to very different numbers of plants per ha than the recommended. The intensity of the distortion occurs to a higher degree once the length of the serial communication chain increases.

Research carried out in India reveals that farmers have increased their acquired knowledge on recommended practices with the introduction of the T&V model, but that the levels of knowledge of different practices are not stable over time (Feder et al: 1985a:15-19). As the T&V system utilizes many communicators to convey the message to ultimate FFs, message losses and distortions can occur. The knowledge or information delivered by the SMOs might not be received at the end of the communication chain — the FFs. A recent Indian study indicates that the information gap is considerably higher at the FFs level (Pandy and Mathur: 1983). The Sri Lankan T&V model utilizes serial communication through a number of steps as the message is passed to the FFs, namely Research Centers, SMSs, SMOs, KVSs and CFs. The main emphasis in this study will be on the dissemination from SMOs to FFs. No Sri Lankan research has been undertaken to analyze possible knowledge gaps and distortions in the T&V context so far, even though empirical studies by Gunawardena and Chandrasiri (1980); Hindori and Renselaar (1982); Sivayoganathan (1980, 1985) are important in helping us to understand how the system works.

Part IV

EMPIRICAL EVIDENCE AND CONCLUSIONS

Chapter 9

EXTENSION COVERAGE IN THE SRI LANKAN KNOWLEDGE SYSTEM

9.1 Presentation

This chapter deals with the findings related to the first research problem — extension coverage. However, quantitative analysis for both first and second research problems was based on the data collected through the same purposive sample. Therefore, the methodological procedure which is common to both research problems will first be explained. Second, the findings will be presented to test the hypotheses formulated for the first research problem.

9.2 Methodology

The second sample covers 3 SMOs, 10 KVSs, 50 CFs and 50 FFs purposively selected from the Central Segment of the Matara district. This sampling procedure allows investigation of the **vertical**

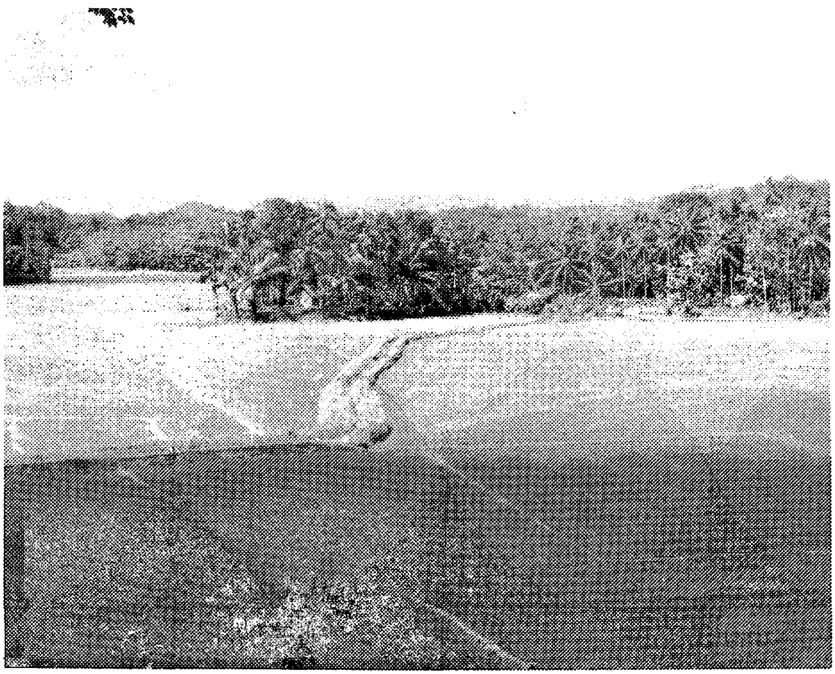
coordination established by the formal T&V system. In fact, both research problems were based on the assumption that the present extension system utilizes serial communication. In order to investigate its effects, players at each level had to be selected.

First, the central segment was selected. This is because, paddy farming is relatively more prominent in this segment than in the other two segments of the district. Generally, extension messages are formulated at the segment level, as different segments require different messages. Therefore, the segmental level can be considered as the starting point for the extension messages which will be disseminated through the extension structure to the ultimate users. For this reason the sample could be confined to one segment. At the segmental level, the SMO (Plant Protection), the SMO (Paddy) and the SMO (Other Field Crops) provide the knowledge input into the extension system. Hence, they can be considered to be the source of serial communication.

Second, out of the seven Agricultural Service Center ranges which belong to the central segment, two ranges, namely, Mapalana and Wilpita have been selected. All the KVSs divisions of these two ranges were subjected to investigation. Mapalana and Wilpita ranges consist of six and four KVSs divisions, respectively.

From each KVS division five CFs were drawn randomly from the 'list of Contact Farmers' which was available at the Agricultural Service Center. These lists were prepared by the respective KVSs. The ten KVSs divisions made a sample of 50 CFs. However, during data collecting, seven CFs out of the original selection were substituted due to various reasons. For example, some were members of different village organizations but not engaged in paddy farming, and some were land owners who rented out their paddy fields and were not active in paddy cultivation. However, their names were in the list of contact farmers. Such units were excluded from the sample but substituted by other CFs from the same KVSs' divisions.

Figure 9.1: A contact farmer serves many paddy tracks



Next, for each CF, one FF was selected. Generally, a CF was assigned to number of Yayas (see page ???) or tracks, as the 'territory' for which they were expected to perform their task. Presently, the T&V system attempts to organize farmers on the Yaya basis. The number of farmers in a Yaya varies to a great extent. The CFs do not maintain lists of their respective FFs. Some CFs were able to name some of their FFs but it has been observed that CFs have tendency to name progressive farmers, relatives or friends who pay respect to them. Hence, to avoid such personal biases, FFs were selected from the general list of paddy farmers at the Agricultural Services Center but considering respective Yayas of the selected CFs. As one FF was selected for each selected CF, the total FFs in the sample numbered to 50. Fig. 9.2 illustrates the flow chart of the sampling procedure.

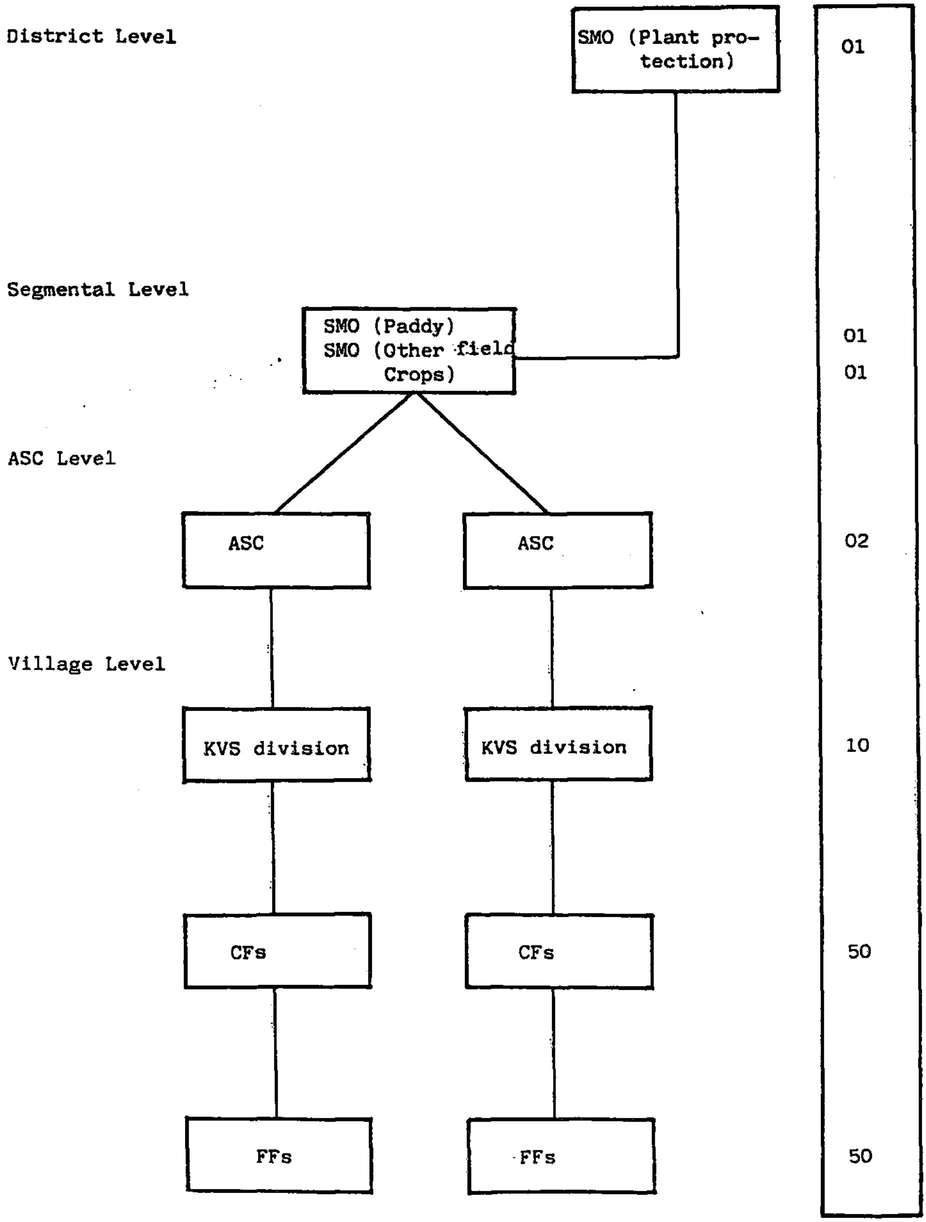
Two separate questionnaires, one for KVSs and another for CFs and FFs have been used to collect data from the second sample. Before the survey the questionnaires were pre-tested with three KVSs, five CFs and five FFs respectively, who fall outside the second sample (Appendices 3 and 4). In-depth personal interviews were carried out with three SMOs. The survey of 10 KVSs, 50 CFs and 50 FFs was done during Feb - June 1986. An interview consumed approximately 45-60 minutes. During the survey, many difficulties were encountered. Among them, transportation problems, difficulties in contacting farmers during work hours and difficulties in convincing farmers to participate in the study can be mentioned as major constraints. The government had launched a 'Food Stamps Scheme' for welfare of low income groups. Government officials were investigating the eligibility of food stamps receivers and once a receiver was found out to have a higher income than the accepted norm, he lost the benefit. In this situation, any investigation carried out at the village level was subject to curiosity and suspicion. The reference period for the study was the 85/86 Maha season. Hence, all the quantitative data were refer to this season and the survey has been conducted just after the harvesting period of that season. Qualitative information was gathered without referring to a particular season, but it was collected during Sep 85 - Sep 87.

Two code books were developed to facilitate the tabulation process. Each questionnaire was carefully edited and the data transferred to code sheets. Separate code sheets were used for KVSs CFs, and FFs. Finally, data were stored on diskettes and statistical analysis was done using the SPSS-X program.

9.3 Extension bias towards innovative farmers

One of the hypotheses made with respect to the first research problem is that the formal extension system is biased towards selecting innovative farmers as CFs for the farming community. Past research shows that extension effort is mostly directed to innovative farmers and further, that innovative farmers often do not repre-

Figure 9.2: The sampling procedure



sent the farm population. Evidence for such generalizations was discussed in chapter 7. The danger is that the benefits from extension are largely reaped by a small number of well-off farmers. Such past findings directed this study to investigate the existing situation in the context of T&V reform.

9.3.1 Adoption index

'Innovativeness' is the degree to which an individual or other unit of adoption is relatively earlier than other members of the social system in adopting new ideas (Rogers: 1983:36). This study constructs an adoption index which can be utilized to measure the degree of innovativeness of the farmers. The procedure applied to develop the adoption index is very similar to that used by Ascroft et al (1973:85-88) in their Kenyan experiment. The procedure applied is as follows:

(a) Case materials were collected to identify the innovations delivered to the farmers during the past decades.

(b) From these innovations, eight were selected by paying attention to those which were applicable to the entire district. The selected innovations were HYVs, dapog nursery, transplanting, chemical fertilizers, chemical weed control, chemical pest and disease control, using a thresher and clearing the stubble.

(c) Questions were set in the questionnaire to receive the precise year in which each farmer adopted each of the innovations in his field.

(d) Substract each of these years from the reference year (1985).

(e) Add one year to each difference in order to allow those farmers who have adopted a particular innovation during the reference year at least to receive a score of one. This distinguishes them from the farmers who have not yet adopted that innovation.

(f) Factor analysis was used to select items for the adoption index. According to the results, seven innovations were selected.

(g) Add all the scores attributed to each of these seven innovations to make a single score which is referred to as the **adoption index**.

Table 9.1: Results of the factor analysis

Unrotated factor matrix		
Innovations	Factor 1	Factor 2
HYVs	.53308	.36875
Dapog nursery	.63192	-.49432
Chemical weed control	.72672	.38047
Chemical fertilizers	.80189	.11900
Chemical pest and disease control	.68912	.21176
Using of a thresher	.09095	.52512
Clearing the stubble	.38669	-.57446
Transplanting	.66473	-.34252
Total variance explained	36.6%	16.3%

The above constructed adoption index locates every farmer on a scale which has a range of scores from 0 to 145. A higher score for a farmer means that he is relatively earlier in adopting innovations than the rest. Hence, this adoption index measures the innovativeness of the farmers. The following paragraphs present the results of reliability analysis and factor analysis.

9.3.2 Factor analysis

Table 9.1 presents the results of the factor analysis. It shows that except the innovation using of a thresher, the other seven innovations load rather high on factor 1. In a principal components solution like this, the unrotated first factor can be regarded as a general factor representing the main dimension underlying the variables. It explains more than one-third of the total variance. The seven innovations are regarded as components of one adoption index.

Some of the innovations such as HYVs, chemical weed control, chemical fertilizers and chemical pests and diseases control are generally introduced as one package to the farmers. However, they were different innovations, so that farmers are free to make decisions on each individual innovation. Once a HYV is introduced to a farming community, it is very common that a fertilizer recommendation is tailored to it because HYVs give a high response to chemical fertilizers and correct fertilizer application brings a considerable yield increase. Next, most of the HYVs are short plant types. Hence, unlike the fields planted with traditional long plant types, weeds provide severe competition for HYVs. As a result, yields can suffer considerably. Therefore, weed control has become a must in the fields planted with HYVs. This influenced extension to disseminate messages on weed control measures along with varietal recommendations. If the weeds are not controlled, it is difficult to gain an economic benefit from HYVs. Finally, until recently, rice breeders were interested especially in improving yield without much concern for resistance to pests and diseases. Therefore, many of the recommended HYVs were susceptible to pests and diseases. They produced higher yields only under controlled conditions. However, pests and diseases outbreaks were observed frequently and in many instances, fields planted with HYVs were severely affected. In order to reduce the economic losses that occurred in such adverse situations, chemical pest and disease control became an important operation.

The dapog nursery is an innovation which produces seedlings for transplanting. Once a decision has taken to adopt transplanting as the plant establishment method, it is clear that a nursery has to be made to have seedlings. As mentioned above, the dapog nursery provides this requirement and it is an easier method than the wet nursery. However, transplanting is a labour-intensive operation. Further, the transplanting period coincides with one of the labour peaks of paddy cultivation. Hence, it is evident that high labour costs are associated with this cultural practice. If the field is not free from the previous season's stubble, much has to be spent on clearing before transplanting. The clearing operation is also a labour-intensive one and coincides with the same labour peak. Hence, once a farmer has decided to adopt a dapog nursery and transplanting, there is a tendency to adopt clearing operation so as to reduce labour costs. The decision to adopt HYVs normally influences the decision to adopt transplanting. Further, transplanting facilitates application of agronomic practices such as fertilization and application of agro-chemicals.

Figure 9.3: Manual weed control now being replaced by chemical weed control

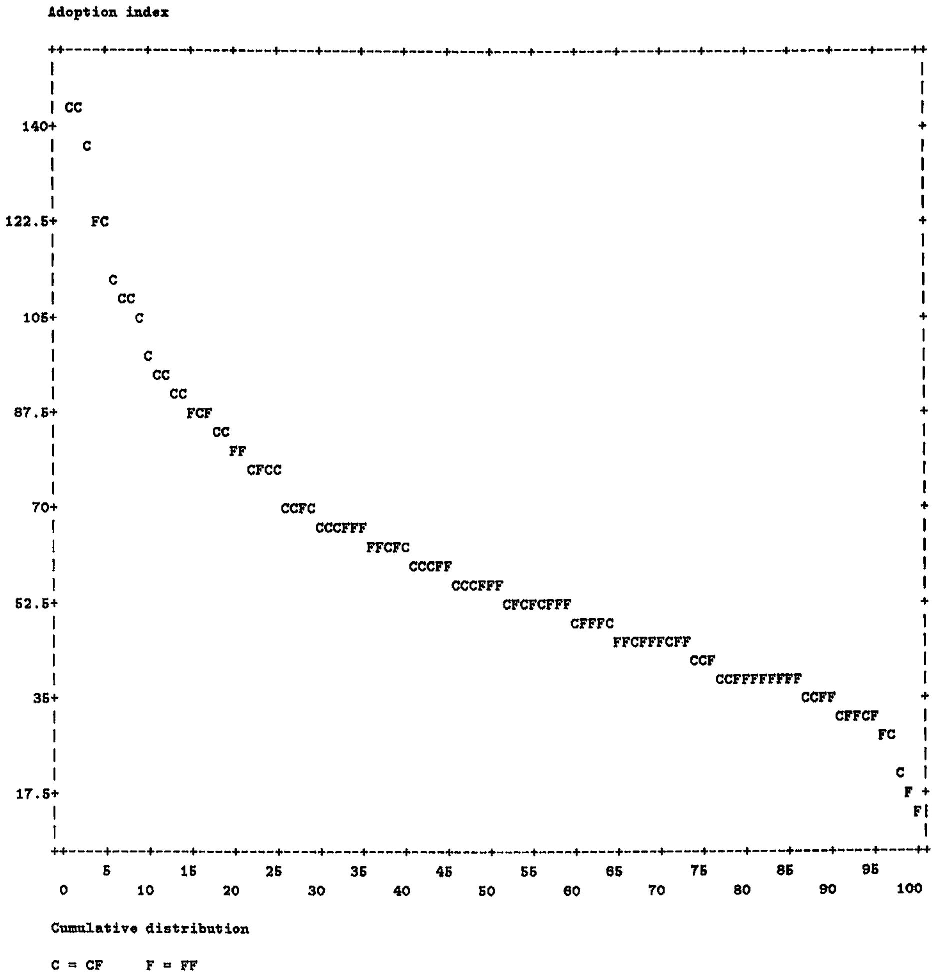
Using of a thresher is the only innovation which does not show any association with the other innovations described. Many reasons can be given for the isolation of this innovation from the rest. First, capital is required to purchase a thresher. Therefore, adoption depends on the opportunities available for hiring the equipment from some other sources. Second, to operate the thresher, a two-wheeled tractor engine is needed at the same time. This implies that many external factors influence the adoption decision of this innovation.

In all, it was decided to construct the adoption index taking the seven innovations out of the originally selected eight. The adoption index locates farmers in a range of scores from 0 to 145. Fig. 9.4 demonstrates the distribution of the farmers on the adoption scale.

9.3.3 Adopter categorization

Innovativeness scores can be used to create adopter categories (Rogers: 1983:245). Three conditions have to be considered when categorizing adopters: (1) the number of adopter categories, (2) the portion of the members of a system to be included in each category and finally, (3) the adopter categories have to be based on an acceptable statistical criterion. Given these conditions, **three** adopter categories were decide upon. The most popular adopter categorization used in the literature is the one developed by Rogers (1983:246). It contains five adopter categories namely, innovators (2.5%), early adopters (13.5%), early majority (34%), late majority (34%), and laggards (16%). The five adopter categories are 'ideal types' and provide guidance to research and serve as a framework for the synthesis of research findings (Rogers: 1983:247). This categorization was primarily based on the standard deviation (sd) of the normal distribution. The five adopter categories were conceptualized by taking one sd to the right and two sds to the left from the mean. This categorization has been criticized by some extensionists due to the fact that it was done purely on a statistical basis. (Röling et al 1976:155 af). Ascroft et al (1973:86)

Figure 9.4: Distribution of the farmers in the adoption scale



have applied another principle. That is, adopter categories were derived by minimizing the variance within groups and maximizing the variance between groups. This procedure has optimized the extent to which members of one category are similar in their degree of innovativeness and leads to more realistic adopter categories.

The portion of the farmers to be included in each of the three adopter categories follows the proportions of the 'popular' model but some of the categories in Rogers' (1983:246) 'popular' model have been combined. First, innovators and early adopters were combined to constitute the innovators of this study. Similarly the early majority and late majority were added to construct the Middle Adopters. The late adopters (laggards) remained as such. Thus the three adopter categories used in this study, **innovators, middle adopters** and **late adopters** were to approximate 16 per cent, 68 per cent and 16 per cent, respectively.

With this rough categorization in mind, an effort was made to create the categories in such a manner that the variance within categories was minimized and the variance between categories maximized. This was done by chosing the most appropriate natural cutting points of the frequency distribution. This finally led to a category of **innovators** which contains 26 per cent of the respondents, of **middle adopters** which contains 60 per cent and of **late adopters** which contains 14 per cent. Fig. 9.5 illustrates the categories developed for this study.

9.3.4 Are contact farmers innovative?

As explained in chapter 7, so far most of the extension efforts were directed towards innovative farmers. This was mainly due to the fact that past extension strategies were based on the progressive farmer approach (Röling: 1976:160, Adams:1982:49). Through its Contact Farmer concept, the T&V model attempts a more equitable interaction with all farmer categories so as to improve extension coverage. To do so, the formal T&V approach seeks to select CFs from all farmer categories without bias. The proponents and

Figure 9.5: Adopter categorization

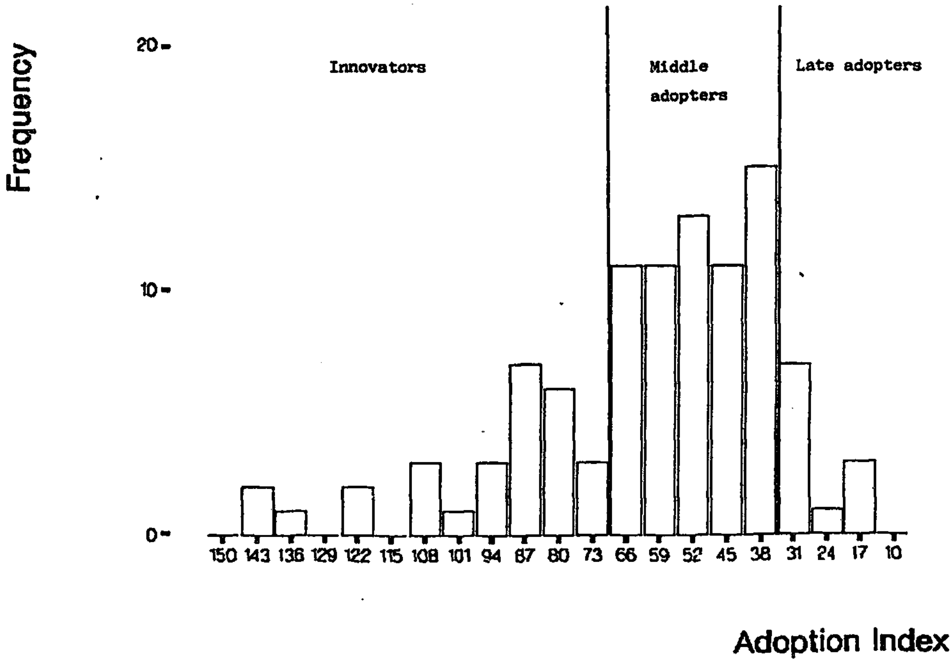


Table 9.2: Association of innovativeness and formal farmer types

Count Row % Column %	Formal farmertype Contact farmers	 Follower farmers	Total
Adopter category			
Innovators	20	6	26
	77%	23%	100%
	40%	12%	26%
Middle adopters	24	36	60
	40%	60%	100%
	48%	72%	60%
Late adopters	6	8	14
	43%	57%	100%
	12%	16%	14%
Total	50	50	100

Statistic	Value	Significance
Kendall's Tau (C)	0.27040	0.0038

opponents of T&V discuss this aspect with limited empirical support. Many of the implementing organizations are uncertain with respect to above theoretical considerations. Based on the adoption index described in the previous sections, this study attempts to explore some of the facts underlying the extension coverage.

The innovativeness of the CFs and FFs was measured by the adoption index. Later, the two farmer types were cross-tabulated with the adopter categories (Table 9.2).

Table 9.2 shows that 40 per cent of the CFs are innovators but only 12 per cent of the FFs belong to the same category. Further, the innovative category is significantly dominated by the CFs who account for 77 per cent of the farmers in that category. Of late adopters, 57 per cent are FFs. FFs fall mainly in the middle adopter category. These findings demonstrate that CFs tend to be innovative farmers. The t-test indicates a highly significant difference in the means of the distribution of CFs and FFs (Fig. 9.6). Such statistics support the contention that there is a significant relationship between being a CF and innovativeness. Thus the evidence supports one of the hypotheses formulated concerning the first research problem — the CFs are mostly innovative farmers. Fig. 9.6 demonstrates that CFs tend to occupy the higher end of the innovation index.

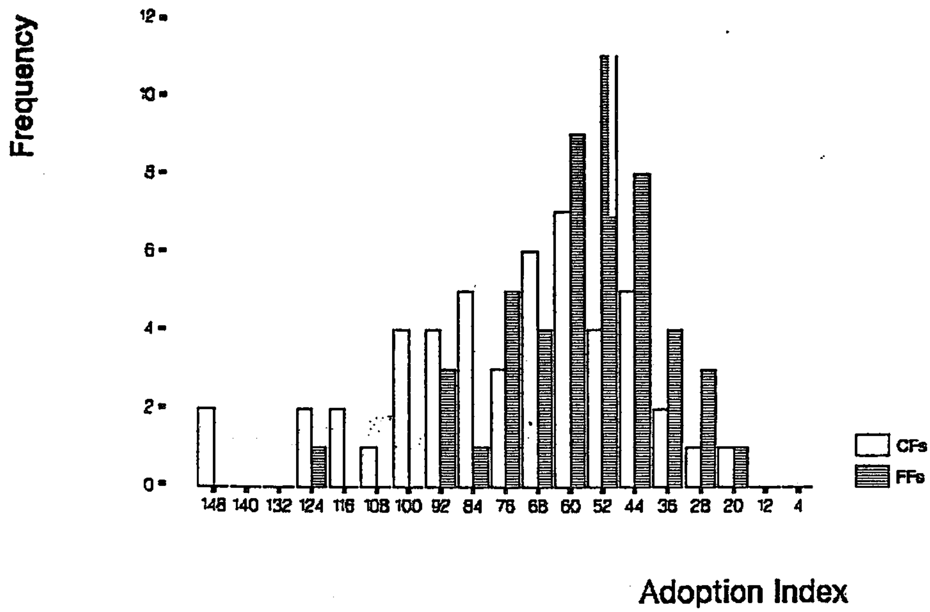
9.4 Extension coverage

As explained in the chapter 7, the coverage of an extension system is measured by the degree of interaction between extension agent and farmer. Usually, the degree of interaction was investigated by intensity and regularity of the extension agent's visits to farmers. In this study, interaction will be investigated according to a **two-step flow**: first, the interaction between extension agent (KVS) and farmers, and second, the interaction between the two farmer types, CFs and FFs.

9.4.1 Type of extension contact

Farmers' main extension contact has been investigated. The formal links established by the the T&V model and the actual links with the farming community have been investigated. The identified contacts in the extension system are the Agricultural Instructor (AI), the KVS and the CF. Further, the Cultivation Officer (CO) has also been regarded as a extension contact point since he is also confined to the village level. Table 9.3 presents the results of cross-tabulation between type of extension contact and farmer type.

Figure 9.6: The frequency distribution and central tendency of innovativeness for CFs and FFs



T-TEST on Adoption index

	No. of Cases	Mean	Standard deviation	T value	Degrees of freedom	2-Tail probability
CFs	50	70.1600	30.086	3.70	98	0.000
FFs	50	51.4600	19.246			

The Table 9.3 demonstrates that 9 per cent of the farmers do not have any extension contact. Only 7 per cent of the farmers keep contact with Agricultural Instructors whereas 64 per cent of them do so with KVSs. CFs are not regarded as a main extension contact by the FFs. Some farmers (19%) regard Cultivation Officers (COs) as their extension contact. These findings indicate that majority of the farmers, including the FFs still consider KVSs as their main extension contact although the formal system emphasizes that CFs are to function as catalyzers to the farming community. Hence, the 'two-step flow' introduced by the T&V system does not seem to function at the village level.

9.4.2 Frequency and regularity of extension contact

Table 9.4 presents the result of the cross-tabulation of KVSs' visit frequency and farmer type. Visit frequencies were classified into five classes namely, 'no visits', visit paid once in three months, once in two months, once a month and once in two weeks. In fact, the last class reflects the intensity expected by the formal T&V system.

Table 9.4 demonstrates that 20 per cent of all farmers have reported 'no visits'. Even 16 percent of the CFs were not visited. Seventy two per cent of the CFs received at least one visit in two months while only 56 per cent of the FFs were visited with this intensity. This implies that there is some difference in KVSs' visits to the two farmer types. This has to be expected as the formal system emphasizes frequent visits to CFs. Also more innovative farmers tend to receive more extension visits than less innovative farmers. However, only 17 per cent of the farmers were visited every two weeks. Furthermore, only 16 per cent of the CFs have received the visit frequency expected by the formal T&V system. What is more 18 per cent of the FFs were visited in accordance with the formal visit schedule. This percentage is slightly higher than that of the CFs. One reason for such situation is that KVSs may be visiting farmers in the informal relationships established by themselves (prior to the T&V reform) outside the formal frame-

Table 9.3: Association between type of extension contact and farmer type

Count Row % Column %	Formal farmertype		Total
	Contact farmers	Follower farmers	
Type of extension contact			
No contact	2 22% 4%	7 78% 14%	9 100% 9%
AIs	5 71% 10%	2 29% 4%	7 100% 7%
KVSs	34 53% 68%	30 47% 60%	64 100% 64%
COs	9 47% 18%	10 53% 20%	19 100% 19%
CFs	0 0% 0%	1 100% 2%	1 100% 1%
Total	50	50	100

Statistic	Value	Significance
Kendall's Tau (C)	-0.00720	0.4711

Table 9.4: Relationship between KVS visit frequency and farmer type

Count Row % Column %	Formal farmertype		Total
	Contact farmers	Follower farmers	
KVSs' visits frequency			
No visits	8 40% 16%	12 60% 24%	20 100% 20%
Once in 3 months	6 38% 12%	10 63% 20%	16 100% 16%
Once in 2 months	15 71% 30%	6 29% 12%	21 100% 21%
Once a month	13 50% 26%	13 50% 26%	26 100% 26%
Once in 2 weeks	8 47% 16%	9 53% 18%	17 100% 17%
Total	50	50	100

Statistic	Value	Significance
Kendall's Tau (C)	-0.07000	0.2687

work. The above findings imply that, in practice, KVSs' visit frequency to farmers is not as formally expected. The formal T&V emphasizes regular visits according to a pre-scheduled bi-weekly programme. The KVS has to visit 6 CFs per visit day. Date and time of the visit have to be known beforehand. However, the qualitative materials show that such schedules are not very practical in the environment in which KVSs work. Hence, visits were frequently irregular. Among the farmers who received at least a visit in three months, two-thirds reported that visits are irregular and the proportions for CFs and FFs seems to be the same. Thus the essential time-bound nature of the T&V system seems impossible to maintain. This raises questions with respect to the return in investment in the T&V system in SRI Lanka.

9.4.3 The catalyzing effect of CFs

Further evidence of the operation of the T&V system in the field was collected with respect to the extension contacts between CFs and FFs. Only 23 per cent of the CFs cooperate with the KVS as expected. Moreover, 54 per cent of the CFs who received KVSs' visits indicated that they were not able to grasp any 'exact extension message' to disseminate. Half of the CFs who received KVSs' messages indicated that message content is too complex and, therefore, difficult to work with. On the other hand, only 54 per cent of the FFs reported that they knew their respective CFs. Further, only 13 per cent of the FFs reported that they received some information from CFs, but on an irregular basis. Thus also with respect to CF-FF interaction, the existing extension system differs considerably from the formal one. The Department of Agriculture has realized the problem and certain modifications have already been made in some places. As an example, KVSs are now instructed to meet as many FFs as possible, in addition to the routine visits to CFs.

In all, the two-step flow at the village level should receive careful attention to improve extension coverage and improve implementation of the T&V system.

9.4.4 Backward flow

The T&V model emphasizes the backward information flow through its established steps at the different levels in the extension structure. This implies not only disseminating extension messages from 'higher' levels to the farmers, but also receiving information on farmers' existing problems and feedback on extension offerings. The backward flow in the KVS - farmer linkage has been investigated by looking at the 'inquiry' made for the recommended paddy variety. In fact, this is a feedback to an extension offering. Results show that only 40 per cent of all farmers have inquired about the respective varietal recommendations. The majority (60%) of the farmers who have made such an inquiry are CFs. On the other hand, 56 per cent of the farmers who have not made an inquiry are FFs.

Next, the CF - FF interaction has been investigated. The results show that only 14 per cent of the CFs have received problems from FFs but at irregular intervals. Most of the inquiries were on input supplies or on the paddy insurance scheme. Very few questions concerned technical problems. In most instances, CFs were able to provide relevant information on input supplies. However, it seems that above inquiries were made mostly informally, rather than in the context of the formal CF - FF link. Among the CFs who received FFs' problems, 36 per cent indicated that some of the problems were conveyed to the KVSs. These results show that the feedback function too has many imperfections. Hence, this is another area where attention is required so as to improve the extension coverage of the system.

The following case material illustrates some of the reasons for the observed imperfections in frequency and regularity of KVS' visits.

Remarks of an AI on T&V in practice

This system has some kind of systematic organization when compared to the former one. The problem is its inflexibility.

In normal life many things take place outside the official matters. Extension officers have to devote their time for them too. At village level, without proper facilities, it is difficult to follow the routine. When there are many part-time farmers, routine visits become difficult. The work load is too much for the KVSs. Farmers prefer to come to extension workers rather than going to CFs for their problems. Interaction between CFs and FFs seems to be a weak one. CFs do not cooperate as expected in the system. Very few CFs have understood their role. Many do not come to notified places. There is not much group action among the farmers.

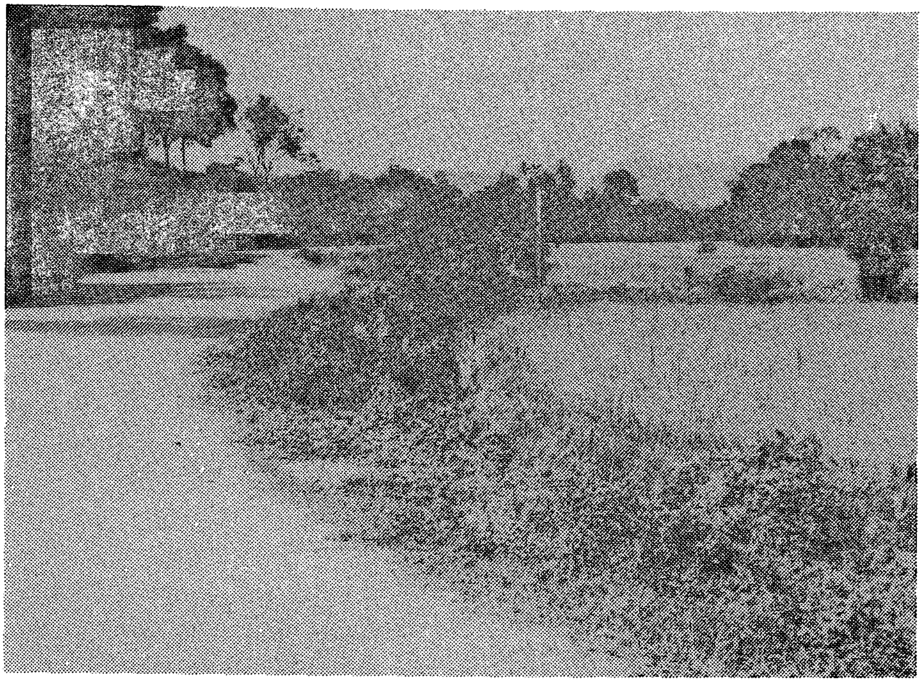
The number of farm families assigned for a KVS seems higher than that expected by the formal system. For example, the six KVS divisions belonging to Mapalana Agricultural Service Center, namely, Kamburupitiya, Narandeniya, Mapalana, Ihla-vitiyala, Karagoda-Uyangoda and Urapola, cover 1020, 956, 1047, 1006, 1248 and 888 farm families, respectively. This means that a KVS has an average of 1000 farmers to serve. In fact, the number of farm families per KVS was further increased as the decision was taken to reduce the number of KVS divisions in the district from the beginning of 1987 from 86 to 60. With limited transportation facilities, difficult roads, specially in the northern segment, and a wider area to be covered, KVSs were forced to perform their duties in increasingly adverse conditions. I was exposed to the situation during the field investigation and have learned to appreciate the difficulties.

9.5 Extension contacts

9.5.1 Innovativeness and extension contact

It is now generally accepted that innovations do not trickle down from one category of farmers to another but that the diffusion process takes place within homogeneous target categories (Röling: 1982:96). Therefore, the current emphasis is to stimulate horizontal diffusion among such homogeneous target categories. This means that extension offering should be delivered to carefully selected target audiences. In this connection, it has been stated

Figure 9.7: A rural road, access to a village



that innovativeness can be considered as a segmentation variable (Röling: 1987:83-85). It is essential to deliver an appropriate offering to each of the target categories. To do so, extension contact with each group has to be strengthened. Moreover, care has to be taken to provide for an equal intensity of extension contacts with all the homogeneous target categories so as to avoid innovative farmer bias. However, even today, many extension programmes tend to pay more frequent visits to innovative farmers. In order to explain these issues in the context of the T&V reform, I cross-tabulated KVSs' visit frequency against three adopter categories. Table 9.5 illustrates the results.

Table 9.5 demonstrates that 58 per cent of the innovators received a KVS visit at least once a month versus 40 per cent of the middle adopters and 28 per cent of the late adopters. More than one-third (36%) of the late adopters had not received a KVS at all, versus 8 per cent of the innovators. The Kendall's Tau (C) test indicates a statistically significant association between intensity of KVS visit frequency and innovativeness.

9.6 Target categories based on access to resources

It has been recognized that heterogeneity of the farm population should receive prime consideration in the process of technology development and transfer. Farming systems research attempts to develop technologies based on 'agro-ecosystem analysis'. Hence, homogeneous target groups are identified on the basis of agro-ecological variables. Such target groups are referred to as **recommendation domains**. Ryan and Binswanger (1978:58) have pointed out that farmers' heterogeneity in resources endowment within an agro-ecological zone raises limitations to technology development. Today, it has been widely recognized that access to resources plays a substantial role in the diffusion process, in that diffusion leads to take place within homogeneous client groups. Such homogeneous client groups can be obtained by segmenting the farm population on resource availability. Hence, attempts are

Table 9.5: Association between KVS visit frequency and innovativeness

Count Row % Column %	KVSs' visits frequency					Total
	No visits	Once in 3 months	Once in 2 months	Once a month	Once in 2 weeks	
Adopter category						
Innovators	2	2	7	8	7	26
	8%	8%	27%	31%	27%	100%
	10%	13%	33%	31%	41%	26%
Middle adopters	13	11	12	16	8	60
	22%	18%	20%	27%	13%	100%
	65%	69%	57%	62%	47%	60%
Late adopters	5	3	2	2	2	14
	36%	21%	14%	14%	14%	100%
	25%	19%	10%	8%	12%	14%
Total	20	16	21	26	17	100

Statistic	Value	Significance
Kendall's Tau (C)	-0.22440	0.0045

presently being made to identify homogeneous client groups for whom technology can be developed and transferred. It is expected that horizontal diffusion will take place within these homogeneous client groups. In fact, this is the essence of the target category approach.

This study makes an attempt to identify homogeneous target categories based on access to resources. Eight resource variables were identified so as to segment the farm population. They are, total paddy acreage (1), owned paddy acreage (2), frequency of flooding (3) (higher value for low frequencies), frequency of KVSs' visits (4), participation in farmer training classes (5), access to credit (6), availability of irrigation facilities (7) and rainfed condition (8). It has to be pointed out that neither the total paddy acreage nor the owned paddy acreage represent 'farm size' or total access to land. In fact, some respondents had plantations of cash crops or were part-time farmers who derived power and social status from other activities. A cluster analysis and discriminant analysis have been carried out, respectively, to identify the resource clusters and to test the effectiveness of this classification. Table 9.6 presents the results.

Table 9.6 indicates two resource clusters. The **high resource cluster** (cluster 1) has higher values for all the resource variables than the **low resource cluster** (cluster 2) except that farmers in cluster 2 are more rain-dependent. Cluster 1 and 2 are represented by 52 and 48 farmers respectively. In this particular situation, analysis has been carried out to identify two farmer categories, but it can be extended to categorize the farm population into three or more categories.

Past research shows that innovations are often adopted by farmers with a relatively high access to resources. Both research and extension have been subjected to criticism for serving only these farmers. To explore this issue for the Sri Lankan case, the two resource clusters were cross-tabulated with the three adopter categories developed in this study. Table 9.7 shows the results.

Table 9.6: Identification of target categories: results of the cluster analysis

Resource clusters

Final clusters	Resource variables 1	2	3	4	5	6	7	8
1. High	.8231	.3615	3.3269	2.3654	1.8654	1.7115	.5769	.5000
2. Low	.7479	.3271	.4375	1.6875	1.6667	1.6875	.5417	.5417

Classification results

Actual group	No. of cases	Predicted group membership 1		2	
1	52	51	(98.1%)	1	(1.9%)
2	48	6	(12.5%)	42	(87.5%)

Percentage of 'grouped' cases correctly classified: 93%

Table 9.7: Access to resources: a prime factor for adopting innovations

Count Row % Column %	Resource clusters 1	 2	Total
Adopter category			
Innovators	16	10	26
	62%	38%	100%
	89%	12%	26%
Middle adopters	2	58	60
	3%	97%	100%
	11%	71%	60%
Late adopters	0	14	14
	0%	100%	100%
	0%	17%	14%
Total	18	82	100

Statistic	Value	Significance
Kendall's Tau (C)	0.46400	0.0000

Table 9.7 demonstrates that 62 per cent of the innovators are in the high resource cluster. The majority of the middle adopters and all late adopters fall into the low resources cluster. The Kendall's Tau (C) test indicates a highly significant positive association between access to resources and innovativeness. The above findings allow the conclusion that innovations are mostly adopted by the farmers in the high resource cluster. This is one of the hypotheses made in connection with the first research problem. As there is a highly significant association between resource endowment and innovativeness, the adoption index seems a convenient segmentation variable to obtain homogeneous target categories for extension purposes.

9.7 Representativeness of the purposive sample

It will not have escaped the reader that the units of the second sample were drawn purposively in order to be able to look at extension coverage of different categories of farmers, and, as we shall see in chapter 9, at the flow of information through the **chain** setup under T&V management system. However, in order to test hypotheses with respect to extension contacts, access to resources, etc., the two categories (CFs and FFs) were amalgamated because they proved not very different and could therefore, treated as one population sample. Purists will have noticed that I even have used significance indicators which assume a random sample. The average size of the paddy holding for the farmers in the purposive sample with those in the random sample used for the description of rice farmer in chapter 4. The average size of the paddy holding for both samples is 0.8 acre (0.35 ha).

9.8 Research-Extension linkage

One of the main objectives of introducing T&V in Sri Lanka was to strengthen the liaison between the research, extension and training divisions of the Department of Agriculture. In the past, various attempts were made to coordinate research and extension activities but they were not very successful. The two divisions executed their programmes as if they were two separate vertical line departments without horizontal coordination. Criticisms of each other were very frequent. The interaction which took place between the two divisions was restricted to ad-hoc hurried consultation, usually seeking assistance in crisis situations. For example, the two divisions came together when there was a pest outbreak. New knowledge was rarely transferred from research to extension and such situations were limited to annual conferences, in-service training and occasionally published pamphlets. Further, such horizontal coordination only took place at the higher levels of the extension system. In all, the former extension set-up had a weak research - extension linkage and awareness of this weakness called for policies to improve the liaison between research and extension. As mentioned earlier, this is one of the factors which led to the adoption of T&V.

Three main formal bodies were established to improve research - extension linkages under the T&V system. They are, a regular Research - Extension Dialogue (RED), Regional Technical Working Groups (RTWGs) and Adaptive Research Units (ARUs). The formal set-up of these bodies has been explained in the chapter 6. In order to understand their actual function, the writer participated in a series of the meetings mentioned above and had had in-depth discussions with relevant officials. The following paragraphs present the outcome.

At the RED, Agricultural Officers are the spokesmen on the part of extension. They present bi-weekly messages for the coming months so that the Research Officers get to know what is going to happen in the field. This gives them an opportunity to provide additional or new knowledge to the messages. However, this is not done in a serious manner. Extension hardly obtains new knowledge from these meetings. The Research Officers only convey new or already developed information to the extension officers when they ask for it or when a problem comes up. On the other hand, once the Research Officers have given information, they usually do not get any or satisfactory feedback from extension. This is true for both RED and RTWG meetings. It become clear that fewer and fewer questions have been asked by extension officers since T&V was introduced. This is one of the reasons why the frequency of the RED meetings has been reduced from once a month to once in two months. This can be seen as a modification to the formal system which reduces the strength of research - extension linkage.

The view from research

> 'In order to keep the close connection between research and extension, extension personnel should bring more and more questions to research. But for most of the problems they put forward, solutions have already been given. They repeat the questions and some times problems are mis-identified. In rare occasions, extension conveys problems they have identified which are relevant to significant number of farmers' — a Research Officer comments.

The RTWG meeting allows presentation of the progress made during the previous season and of the targets and proposals for research and training for the coming season. Such presentations are done by respective Assistant Directors of Agriculture (ADAs) or Agricultural Officers of the different districts. The possibilities for training are conveyed by the Assistant Director of Agriculture (Training and Education) or SMSs. However, it seems that some of the requested training sessions are not possible due to a small number of training officers in the in-service training center. In fact, there are only two Subject Matter Specialists at the Regional Training Center. They are unable to fulfil the training requirements. Therefore, in many instances, the in-service training center has to depend on other resource persons. One of the objectives of the T&V reform was to strengthen the Division of Training and Education but the evidence show that it is, in fact, slowly dying. Many of its staff are leaving the Division and as a result, there is a severe shortage of trainers.

At the RTWG meetings, there was no presentation of on-going research or planned research at the Regional Research Center (RRC). Furthermore, there was hardly any discussion of the presentations by the extension personnel, so that the impression exists that each district can go with their own proposal without much coordination between other districts or research. Some of the problems presented to research were very vague and did not seem to be pressing problems for a significant number of farmers. On the other hand, Research Officers were not very willing to accept research problems suggested to them by extension. They have their own research programmes, in addition to which they satisfy some extension needs. At the Regional Research Center fewer and fewer experiments for extension are being done every season (Seegers and Blok: 1988:09). At present, the duration of the RTWG sessions are limited for one day, although the formal T&V model specified a meeting of two days.

The Subject Matter Specialists of the Regional Training Center are not much involved in solving problems forwarded by the extension. They can be regarded as training officers and do not constitute or realize any significant links between research or extension. So far, they have not received much profit from research, as they get very little information. On rare occasions, Subject Matter Specialists and Research Officers visit the fields. This is mostly done at the request of the extension staff. However, many Research Officers have little contact with extension officers. The extension officers do get information from the Research Officers but not at the formal meetings. They receive information through informal contacts and during in-service training. However, such situations are limited.

In the linkage between research and extension described above, the role of SMO of the district is not as it had been expected — a liaison between research and extension. The relation between research and extension, if there is any, is mostly governed by the contact between Research Officers and and Agricultural Officers. Since the Agricultural Officers are in the same rank as Research Officers, the Research Officers prefer to have discussions with Agricultural Officers rather than SMOs. The SMOs are not invited for RTWG meetings and are not often given the opportunity to visit the research station. Further, as there is hardly any adaptive research going on in the district, SMOs contact with Research Officers is limited to RED meetings and to occasional visits of Research Officers to their segments.

The Adaptive Research Unit does not function according to the formal description. There is hardly any adaptive research work going on in the district. The Adaptive Research Officer (ARO) has limited his attention to the Nilwala Ganga Project area. Lack of personnel resources and necessary facilities have meant a great limitation to adaptive research work. Therefore, the Adaptive Research Unit has not contributed much towards strengthening the research - extension bond as previously assumed. As we have seen in chapter 7, adaptive research can play an important role in appropriate technology development and in bridging 'fatal gaps' in the AKS (McDermott: 1987:89-93).

The above findings demonstrate that the **actual situation** is quite different from what one would expect from the description of the **formal system**. The two divisions (with the Training and Education division, there are three) are still not achieving the horizontal coordination explained in the 'guidelines' of the Department of Agriculture. The bodies set up for the purpose are not successful in realizing the task — strong research-extension linkage.

Chapter 10

INFORMATION FLOWS IN THE SRI LANKAN KNOWLEDGE SYSTEM

10.1 Introduction

This chapter presents findings related to the second research problem — the determinants of information flow in the Sri Lankan AKS. The main emphasis is on the hypotheses made in relation to the second research problem. Arguments will again be presented to understand what causes the difference between the **formal T&V system** and **actual practice**. The findings which are presented refer to the following components of the knowledge dissemination processes in the T&V system.

(a) Flow of the information conveyed at the bi-weekly training sessions, through the formal extension system.

(b) Farmer knowledge on recommendations and practices which were transmitted earlier.

(c) Existing knowledge gaps between different levels of the formal extension hierarchy.

(d) Association of farmer comprehension with other variables.

10.2 Extension messages and their dissemination

In order to ascertain the extension messages which are used later in this chapter to analyse the information flow, some qualitative materials were collected prior to quantitative data collection. These qualitative materials facilitated understanding how extension messages are formulated and how extension personnel is involved in the context of T&V system. Further, the materials significantly supported the development of questionnaires for quantitative data gathering. The case materials were obtained through participation in different formal sessions established in the reformed extension system and further, conducting in-depth personal interviews with extension officials as well as with farmers. The following paragraphs summarize the observations concerning the knowledge dissemination process.

First, attention was given to extract extension messages. This was done by participating in fortnightly training sessions held at the District Training Center (DTC). Observations made during the training sessions, and discussions with Agricultural Officers, SMOs, AIs and KVSs after the sessions facilitated obtaining case materials.

All the AIs and KVSs who are assigned to an Agricultural Officer's segment are strongly requested to be present at the fortnightly training sessions. Presided by the segment Agricultural Officer, the training session started at 9.00 a.m. and ended at 1.30 p.m. During the session, messages for the coming two weeks were presented by three SMOs in a sequence. Each took approximately one hour. The SMO (Paddy) concentrated on cultural practices with respect to paddy nurseries and plant establishment methods.

The SMO (Plant Protection) made a descriptive coverage on identification and control of stem borer attack. Finally, SMO (Other Field Crops) dealt with fertilizer application for budded mango plants and the preparation of a supplementary sugar solution for bees. They used the black-board and flannel board for their illustrations. They tried to make the session a discussion rather than delivering formal lectures, by asking questions from the audience and moreover, calling participants to the black-board on and off to explain something. However, in many instances, the audience gave little response.

The formal T&V system emphasizes transmission of appropriate messages to farmers in bi-weekly intervals. The above case shows that extension messages were pieces of information concerning a recommendation or a practice which were supposed to be transmitted to the farmers through the extension system. The elementary difference between the formal and actual systems concerning the concept of information is that, in the actual situation, information is only considered as such if received from a higher level. A higher ranking officer in the organizational structure is always correct in an argument or when answering a question. Even though the AIs and KVSs acknowledged the farmer as a source of information, higher ranking officials are reluctant to do so. They regard farmer responses more as data than information. These points have been highlighted by my two Dutch colleagues, Seegers and Blok (1988). Hence, in the actual situation, information or messages follow only one direction. Further, messages remain relatively unchanged over time as extension is not receiving much new information from research. Many of the messages are based on recommendations which were conveyed earlier. This is another difference between actual practice over the formal one. There is hardly any new knowledge to be disseminated.

Knowledge flow in practice, the KVS's point of view

Bi-weekly training normally follows a pre-scheduled series of lectures. The messages are general to the whole segment and are technical and include too much content. Some messages are not transmitted from the extension system to the farm-

> ers even though the formal extension system expects such a way of knowledge dissemination. Some messages are, in fact, inappropriate. For example, the message is for land preparation but some farmers have already established their fields. The messages are useful to improve my knowledge. Generally, at the Agricultural Services Center level we decide what to convey to the farmers through our existing knowledge. Most of the farmers' problems too are solved in a similar manner. Farmer feedback is very poor — a KVS comments.

The extension messages were developed according to a pre-scheduled work programme. This work programme was formulated by the respective Agricultural Officer and SMOs for a particular Agricultural Officer's segment. Therefore, to some extent, each Agricultural Officer's segment can make its own arrangements for fortnightly training. Dates for these bi-weekly training sessions were fixed to coincide with AIs' and KVSs' bi-weekly work programmes. The work programme was based mainly on the sequence of cultural operations practised in paddy cultivation. Generally, the work programme was designed in such a way as to facilitate training for a particular operation which will be be put into practice after two weeks. This training mostly provides refresher type training. Therefore, extension messages were also of that nature.

Formulated extension messages are conveyed at the fortnightly training sessions. It is expected that the messages will be transmitted to the farming community within the coming two weeks through the established extension path-way of the T&V system. This process has been carefully investigated by taking the messages transmitted at a particular training session, and two weeks later, collecting case material at the farmers' level in order to check the arrival of the messages. A separate checklist has been employed for this purpose.

The results are as follows. The questions based on messages which were transmitted two weeks ago were poorly answered. Many extension messages did not come down to farmers' level within that reference period. However, some farmers responded knowledgeably to some of the questions on the basis of knowledge which they already had. But such cases were very few. It can be concluded that, in general, extension messages which have been stressed at the bi-weekly training sessions do not come down to farmers' level within two weeks.

As the messages given at the bi-weekly training sessions were not transmitted within two weeks, it was difficult to make a quantitative investigation based on those messages at the farmers' level. Therefore, an alternative method has been applied to obtain data for quantitative analysis and this procedure has been explained in section 10.3. However, discussions were held with AIs and KVSs to find reasons for the earlier finding. Apparently, bi-weekly training helps to refresh the extension workers' knowledge on recommendations and farming practices. The same message or the knowledge acquired during a particular bi-weekly training session may not be transmitted to farmers within the coming two weeks but the knowledge is **stored, retrieved and released** when requested by farmers or when extension officials feel there is a need to do so. One major reason for not conveying the messages within two weeks is that, even in a one KVS's range, all the farmers are not in the same cultivation stage. Some are still preparing their land but some have already completed planting. Hence, the messages given at the fortnightly training are not fully appropriate for every condition extension officials meet in the field. In many instances, AIs and KVSs modify or change the common messages they received in order to fit them to a particular condition. Such modifications and changes are being done at the Agricultural Service Center level. Day-to-day problems of the farmers are being solved at the office day which KVSs hold at ASC or during the farm visits by using their **stored** knowledge. Therefore, here too, knowledge is discharged only when demanded.

This result indicates that, although the formal system emphasizes that a set of given messages must be conveyed during a specified period, in practice this task is not achieved. This makes another important difference between actual situation and the formal system. Training is mostly helpful in refreshing the knowledge of extension workers. Thereafter, they act as **store houses** of agricultural knowledge and convey part of their knowledge when requested by farmers or when extension field officers feel that a particular message is important to a particular set of farmers. This procedure seems more similar to the knowledge dissemination process practised in conventional extension systems. There is, however, no role for written communication in the formal T&V system to facilitate knowledge storage and retrieval.

10.3 Selection of knowledge measures for quantitative analysis

10.3.1 An alternative method of analysis

As an alternative method to investigate the knowledge dissemination process with quantitative methods, all extension messages delivered at the bi-weekly training sessions during the season were taken into account. These messages were obtained through in-depth discussions with the Agriculture Officer and with three SMOs. The pre-scheduled work programme and officials' field record books supported the identification of past extension messages. Out of these messages, 15 messages were selected on the following criteria.

(a) Messages which were transmitted to the entire Agricultural Officer's segment.

(b) Messages which focus on critical practices in paddy cultivation and which were stressed by extension.

(c) Messages distributed during the cropping season (combination of the messages given at the beginning, middle and at the end of the cultivation season).

(d) Messages which have 'knowledge items' for quantitative analysis.

In all, 45 **knowledge items** were selected from these messages. A knowledge item refers to **specific information** contained in a message. The 45 knowledge items were focal points which were gleaned from the selected messages. As an example, in a fertilizer recommendation, the type of fertilizer, the quantity per acre and the time of application became focal points and were considered as knowledge items. Later, these items were grouped by drawing complementary items together. Such groups were referred to as **knowledge measures**. There were 7 of them. They concern,

1. High yielding rice varieties,
2. Pre-seed treatments,
3. Plant establishment practices,
4. Chemical fertilizer applications,
5. Pests, diseases and toxic conditions,
6. Weed control and,
7. Weights and measures.

Further, total knowledge has been computed by taking the knowledge items together. The resulting variable is referred to as 'total knowledge'. This variable is also called 'knowledge measure 8' below.

10.3.2 Knowledge measures

The knowledge measures were employed as a device to measure farmer knowledge. In fact, they were developed to investigate the information flow in the extension system. This does not mean that a lack of knowledge of the items investigated on the part of a farmer implies that such a farmer is ignorant or stupid. We should never forget that, farmers always have appropriate knowledge to their conditions and extension does not always transmit perfect knowledge. I have used such knowledge measures based on 'official' information to be able to analyse the flow in the serial communication set-up of T&V.

The knowledge measure regarding **high yielding rice varieties** has three knowledge items. They are, name of the variety (BG 379-2, BG 400-1, BG 94-1, BG 34-6 and BG 34-8), duration of the variety (4 1/2, 3 1/2, and 3 months) and special characteristics embodied in a particular variety (resistance to brown plant hopper, gall midge, blast and iron toxicity). Farmers were tested on these knowledge items. Care has been taken to focus the investigation with respect to the recommended variety on relevant aspects for a particular KVS division.

The knowledge measure on **pre-seed treatments** has 7 knowledge items. They were mainly based on different pre-seed treatments recommended to ensure a strong stock of seed for planting. The knowledge items include a method of removing weed seeds, a method of removing unfilled grains, a procedure for the germination test, the accepted germination percentage, the duration of soaking, the duration of storing and the depth of storing. Such knowledge items were common to all the KVS divisions in the segment. Therefore, there was only one standard.

The knowledge measure on **plant establishment practices** has 8 knowledge items. These knowledge items were taken from the recommendations made to farmers on plant establishment practices such as spacing for transplanting between rows and within rows, spacing for row seeding, the procedure adopted for a dapog nursery, the seed rate for dapog nursery, the seed rate for broadcasting, the nursery area required to transplant an acre of field, and the rate of seedlings per hill in transplanting. These knowledge items were also common to all the KVS divisions in the segment.

The knowledge measure on **chemical fertilizer application** has 9 knowledge items. These knowledge items were selected from three fertilizer recommendations made for rice cultivation. They are the recommendations on basal dressing, the first top dressing and the second top dressing. Each of them has knowledge items such as the type of mixture, the quantity per acre and the time of application.

The knowledge measure on **pests, diseases and toxic condition** were mostly formulated on the messages given for the identification of the plant symptoms caused by the above conditions. It consists of knowledge on identification of plant symptoms caused by common paddy pests (stem borer, brown plant hopper, gall midge and mole cricket), by common diseases (blast and brown spot disease) and by the toxic effect of excess iron in the soil. Further, a precautionary measure for the last cause has also been included. Altogether the measure has 8 knowledge items. The messages based on above knowledge items were common to the entire segment.

The knowledge measure on **weed control practices** has 5 knowledge items. They were time of first weeding, methods of mechanical weeding, chemicals used for broad leaved weeds, chemicals used for narrow leaved weeds and precautionary methods used at spraying operations.

Five knowledge items have made the knowledge measure on **weights and measures**. There were no special messages based on weights and measures. Hence, knowledge items were extracted from other messages and later grouped into one knowledge measure. The knowledge items were the capacity of a knapsack sprayer, the standard quantity of a urea bag, the metric equivalent to a bushel of paddy and the measurement of percentage pest damage.

10.4 Farmer knowledge on cultivation practices

10.4.1 Method

The knowledge measures described in section 10.3 have been used to evaluate farmer knowledge. First, 100 farmers (50 CFs and 50 FFs) were asked to respond to these knowledge measures. Frequency counts and basic statistics were obtained for each measure. The following paragraphs illustrate the results.

Figure 10.1: Knowledge dissemination: a training session

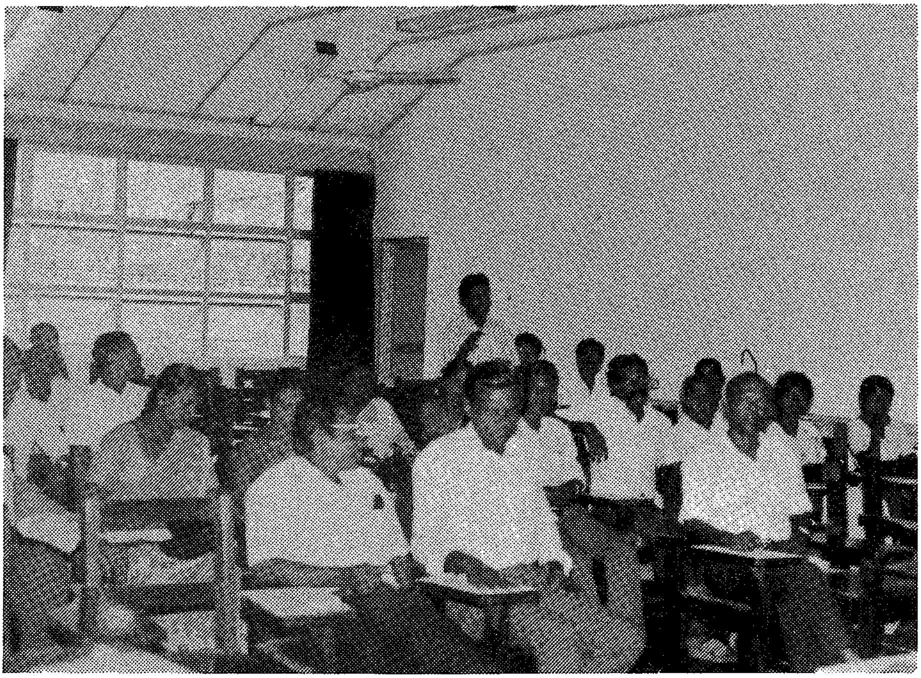


Table 10.1: Farmers' mean knowledge score and score range for each knowledge measure

Measure	Mean score	Score range
1. High yielding rice varieties	2.46	0 - 3
2. Pre-seed treatments	4.00	0 - 7
3. Plant establishment practices	3.84	0 - 8
4. Chemical fertilizer application	6.52	0 - 9
5. Pests, diseases and toxic conditions	4.19	0 - 8
6. Weed control	3.08	0 - 5
7. Weights and measures	3.09	0 - 5
8. Total Knowledge	27.18	0 - 45

N = 100.

10.4.2 Farmers' existing level of knowledge

Table 10.1 presents the mean knowledge score obtained by the farmers and the range for each measure. In the following discussion, high, medium and low levels of knowledge are used as a proxy to describe farmers' knowledge levels. Such levels correspond to above 75 per cent, between 75 and 50 per cent and below 50 per cent of the maximum score which can be obtained for each knowledge measure.

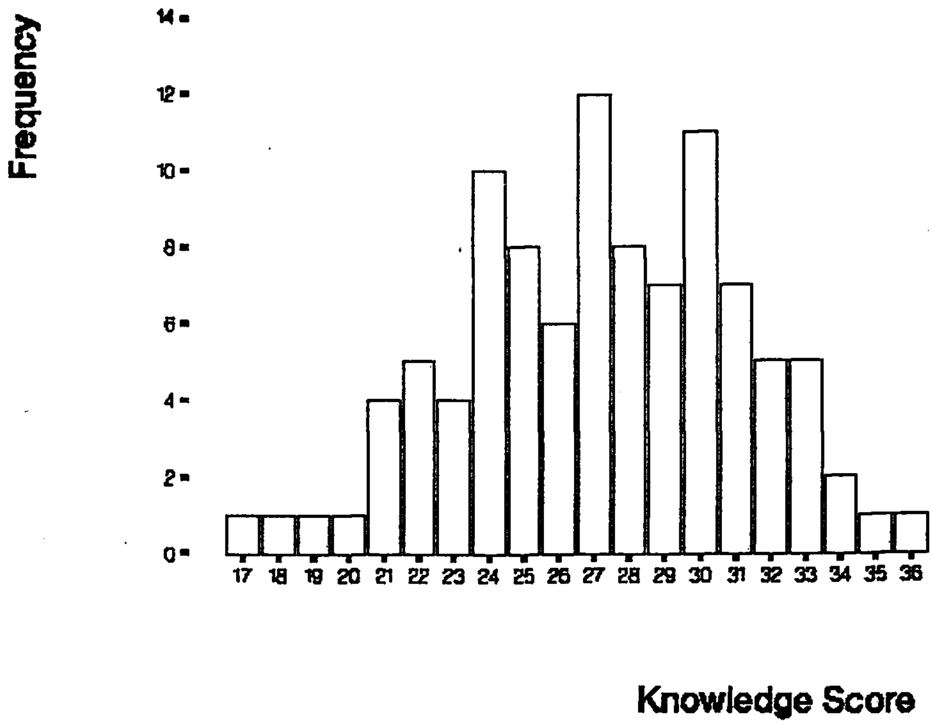
Table 10.1 reveals that farmers have a high level of knowledge on varietal recommendations. In a range of scores from 0 to 3, farmers obtained a mean score of 2.46. Two thirds of the farmers know all these knowledge items. Only 7 per cent of the respondents reported no knowledge on varietal recommendations. Hence, it is evident that farmers have sufficient knowledge on the HYVs recommended for their conditions. On pre-seed treatment recommendations, farmers show a medium level of knowledge. In a range of scores from 0 to 7, farmers scored a mean of 4.00. However, non of them obtained the maximum score, but 22 per cent and 14 per cent of the farmers scored 5 and 6 respectively. In contrast, one third of the farmers were not able to mention more than three knowledge items. Farmer knowledge on plant establishment practices seems to be low. In a range of scores from 0 to 8, farmers scored a mean of 3.84. Nearly half of the farmers (44%) scored 3 or below. Thirty seven per cent of the farmers know four of the knowledge items. Hence, it can be stated that generally, farmers have low knowledge on plant establishment recommendations.

Farmers showed a medium level of knowledge with respect to the recommendations made for chemical fertilizer applications. In a range of scores from 0 to 9, farmers obtained a mean score of 6.52. However, approximately 25 per cent of the farmers have low knowledge about fertilizer applications. Fertilization is an important cultural operation in paddy cultivation which is responsible for a significant proportion of the production cost. Farmer knowledge on identification of pests, diseases and toxic condition seems to be medium. In a range of scores from 0 to 8, farmers obtained a mean score of 4.19. However, it has to be mentioned that one third of the farmers have little knowledge. Such low level of knowledge will result in an incorrect choice and application of chemical control measures. Chemicals are high cost inputs. Therefore, inadequate knowledge will prevent the farmer from reaping the benefit from the application of control measures. For weed control recommendations, farmers have medium level of knowledge. In a range of scores from 0 to 5 farmers obtained a mean score of 3.08. However, one fourth of the farmers has a low level of knowledge and this too can lead to incorrect selection and application of agro-chemicals.

Farmers showed a medium level of knowledge on weights and measures used in paddy cultivation. In a range of scores from 0 to 5, farmers obtained a mean score of 3.09. However, only 29 per cent of the farmers reported a score above 3. Hence, there is room for improvement of farmer knowledge on weights and measures. This knowledge area is specially important because correct measurements of fertilizers and agro-chemicals greatly depend on firm understanding of weights and measures.

Finally, farmers' overall knowledge of paddy cultivation has been tested by pooling all the knowledge items. Fig. 10.2 illustrates the frequency distribution and measure of central tendency for

Figure 10.2: The frequency distribution and central tendency for farmers' total knowledge



farmers' total knowledge. In a possible range of scores from 0 to 45, all farmers were concentrated on the range between 17 to 36. The mean is 27. This implies that in general, farmers have a medium level of overall knowledge on paddy cultivation. Further, as the mean, median and mode are the same (27) and SD of 3.95, the knowledge distribution over the farmers approximates a normal distribution.

10.4.3 Discussion

Farmer knowledge on varietal recommendations is quite satisfactory. Many reasons can be given for this high knowledge. First, varietal recommendations were introduced some years back and extension efforts have been continuously made to popularize them. In every cultivation season, some of the extension messages have directly dealt with varietal recommendations. Further, demonstration plots and trials were often made in the farmers' fields. Second, seed paddy distribution was mainly the responsibility of government departments. Therefore, in many instances, only the seeds of recommended varieties were available. As many farmers cultivate paddy as the main crop, this has forced them to acquire knowledge on recommended varieties. Third, varietal recommendations were simple to understand. Furthermore, HYV seeds are a low cost innovation. Hence, there was room to develop interest and acquire knowledge. Finally, as a result of the above reasons, many farmers have adopted HYVs. It has been stated in the chapter 3 that in Matara district, HYVs represent 85 per cent of the paddy acreage Hence, it can be assumed that farmers have gained a good knowledge on varietal recommendations.

Farmer knowledge on pre-seed treatments is medium on average. However, 1/3 of the farmers have low knowledge on these items. Yet they are embodied in extension recommendations, often in every season and for many years back. But it has been observed that knowledge on certain pre-seed treatments is not satisfactory. Most of the recommendations only have a software component. There is no hardware to feel or see, which normally facilitates knowledge storage and retrieval. Some pre-seed treatments are technically complex from the point of the user. For example, the germination test has many components, such as random selection of 100 seeds from the bulk of paddy seed; soaking in water for 12-18 hours; storing for 48 hours; careful observation on the seedlings; calculating the germination percentage; and knowing the standard to make a decision. In many situations, these recommendations were not transformed correctly in order to fit into farmer's existing knowledge. Hence, farmers do not see the use. However, pre-seed treatments can provide a low cost innovations, but farmers may not see direct results associated with them. Hence, the farmers may have lost interest and as a result, gained little knowledge. Finally, unlike varietal recommendations, practical demonstrations did not pay much attention to pre-seed treatments or the demonstrations were not properly designed to make for an effective knowledge penetration.

Farmer knowledge on plant establishment practices seems to be unsatisfactory. In a nutshell, there were two types of new technologies introduced, transplanting and row seeding. They have been continuously stressed in extension work programmes. Hence, those recommendations have been highlighted in extension messages in every season. Extension teaching techniques were projected towards these recommendations and often, method and result demonstrations were made in farmers' fields. However, these teaching techniques have given less attention to the cost effectiveness and profitability of the recommendations. The new plant establishment methods allow increased yield per acre and facilitate other cultural operations during the season. Recommendations **per se** did not require a heavy outlay of capital. But these recommendations imply labour intensive operations which overlap with one of the most labour demanding periods in rice cultivation. As a result, in real terms, such recommendations may have brought only a marginal increase in profitability at the farmers' level. Hence, farmers may have been reluctant to develop an interest in these recommendations. This may have resulted in poor knowledge. Further, the recommendations often came with measurements which were not so familiar to the farmer. Such measurements were not oriented to farmers' existing technical competence but were transmitted in the form which extensionists thought appropriate to the clients. This drawback may also have reduced farmer knowledge on plant establishment recommendations.

It has been stated that farmers had a medium level of knowledge on chemical fertilizer applications. In fact, following the introduction of HYVs, fertilizer recommendations were given high priority in paddy culture. In extension work programmes, many messages have been based on fertilizer applications. Demonstrations were very frequent. In addition to government organizations, commercial firms were also interested in research and extension activities associated with chemical fertilizer applications. What is important here is to state that the knowledge input is frequently repeated, reminding the farmer. Further, HYVs respond strongly to artificial fertilizers. Yield increases can easily be observed. As many farmers are using HYVs, it can be argued that farmers should have developed an interest in chemical fertilizer applications. As a result, farmers would tend to seek information. Once the farmers are interested while a free flow of information is available, one can expect a rapid increase in farmer knowledge.

However, chemical fertilizers are very costly. As explained in chapter 3, at present, paddy cultivation is increasingly costly and a considerable proportion of the cost increase can be attributed to chemical inputs. Hence, the resource situation of the farmer will greatly influence chemical fertilizer application. Lack of resources may result in lack of interest and also will not lead to a positive tendency to seek information. Hence, in this particular situation, even though the knowledge input is high, farmers' knowledge remains at the medium level. In many instances, commercial packs contain significant amounts of knowledge which is relatively simple and, therefore, easy to keep in mind. But external sources have to make repetitions because fertilizer applications are done at time intervals. Hence, it is important to disseminate correct knowledge at the most appropriate time. Regular visits to farmers by KVSs are, therefore, required.

It has been demonstrated that farmer knowledge on pests, diseases and toxic conditions is at a medium level in the knowledge scale. In fact, investigations were carried out to test farmers' knowledge on identification of crop symptoms caused by certain pests, diseases and adverse toxic conditions. Correct identification of the cause is greatly correlated to the selection of the most appropriate control measure. This is specially important because, presently, there are many agro-chemicals under different trade names. Some are effective for controlling a wide range of adverse conditions, while some are very specific to one condition. This may confuse farmers. In order to control such adverse conditions in a cost effective manner, exact identification of the cause is essential. This implies that farmers should approximate full knowledge in this area, because unlike previous recommendations, inadequate knowledge may result in crop failure. The identification techniques are, of course, not new. Some farmers may have gained knowledge through their experience. However, in most instances, symptoms are complex and exact identification is not possible at the farmers' level. On the other hand, knowledge gained may not be utilised in every season if there is no outbreak. Further, control measures are costly so that some farmers may not think of using them due to resource limitations. Such factors may result in lack of interest and finally lead to low knowledge. Hence, frequent extension visits are essential to improve the farmers' ability to diagnose the causes of adverse conditions.

Weed control is considered as an important practice as it is evident that weeds can reduce the yield up to 60 per cent. Today, mechanical and manual weed control methods are being replaced by chemical control methods. It has been stated in chapter 3 that, in the Matara district, 75 per cent of the paddy cultivated area has been treated with weedicides. However, as in pest and disease control, there is a range of chemicals on the commercial market. Hence, it is very important to select the correct weedicide for a certain type of weed. Farmer knowledge on weed control has been tested by investigating the association of weed type and the appropriate control measure and further, by other measurements such as time of weeding, precautionary measures etc. For weed control recommendations, farmers have reported medium knowledge. In the extension work schedule, weed control measures are promoted in extension messages and in most instances, they are repeated every season. However, chemical innovations are becoming more and more expensive, and resource-poor farmers may not be so encouraged by such recommendations. Hence, they may not seek information. Further, knowledge on software seems to be complicated by dosages and measurements which can be easily distorted.

Farmer knowledge on weights and measures has been reported to be of medium level. In fact, this knowledge directly contributes to correct usage of other recommendations. Insufficient knowledge on weights and measures may cause other recommendations to be ineffective or may cause crop damages. Especially in agrochemical applications, correct mixing is an essential task. If the recommendation is one oz. of chemical in one gallon of water, and if the farmer is not aware of one oz. or is not provided with an appropriate measure, it is hard to expect a correct application. Hence, this is an area where farmers should approximate complete knowledge. Three reasons can be forwarded to explain the inadequate knowledge level shown by farmers. First, in the extension work programme, this area has not been given much attention. Not many extension messages have been formulated on weights and measures. Second, today more and more metric units are being used in recommendations instead of commonly used local and British units. At the farmers level this transformation seems to be rather slow. Finally, units are not unique to all the recommendations. Different recommendations come with different units. Hence, there is no consistency for easy knowledge storage and retrieval.

10.5 Knowledge variation at different horizontal levels

10.5.1 Mean difference in knowledge

The previously described eight knowledge measures were employed to test the knowledge on paddy cultivation at three levels. These refer to the hierarchy in the formal extension system namely, the KVSs, CFs and FFs levels. The T&V system utilizes these levels for its knowledge dissemination process. Mean scores for each package were computed for each of the levels. The results are summarized in Table 10.2

Table 10.2 demonstrates that for all measures, KVSs obtained a higher mean score than CFs and FFs. Fig. 10.3 visualizes the distribution of scores for KVSs, CFs and FFs and their respective

Table 10.2: Mean score for each knowledge measure at different horizontal levels

Knowledge measure	Level			Score range
	KVSs	CFs	FFs	
1.High yielding rice varieties	2.9	2.5	2.5	0 - 3
2.Pre-seed treatments	6.6	3.9	4.1	0 - 7
3.Plant establishment practices	5.4	3.9	3.8	0 - 8
4.Chemical fertilizer application	8.4	6.5	6.5	0 - 9
5.Pests, diseases and toxic conditions	6.6	4.5	3.9	0 - 8
6.Weed control	4.8	3.0	3.1	0 - 5
7.Weights and measures	4.2	3.0	3.2	0 - 5
8.Total knowledge	38.9	27.3	27.0	0 - 45
N =	10	50	50	

mean scores. In a range of scores from 0 to 45, KVSs obtained a mean score of 39. However, CFs and FFs obtained more or less the same mean score of 27. This demonstrates that farmers have a medium level of knowledge on paddy cultivation practices promoted by extension irrespective of their category. It is clear that a knowledge gap exists between the change agents' level and farmers' level. The T&V system has distinguished two farmer categories, CFs and FFs. However, with respect to knowledge on paddy cultivation, it seems that both categories can be considered as one group. This was the main reason for presenting the frequency distributions for knowledge measures on the basis of all the farmers and not separately for CFs and FFs. On the basis of the above observations, two distinct levels can be identified with respect to knowledge on paddy cultivation practices: the change agents' level and the farmers' level.

Figure 10.3: Distribution of total knowledge scores across KVSs, CFs and FFs

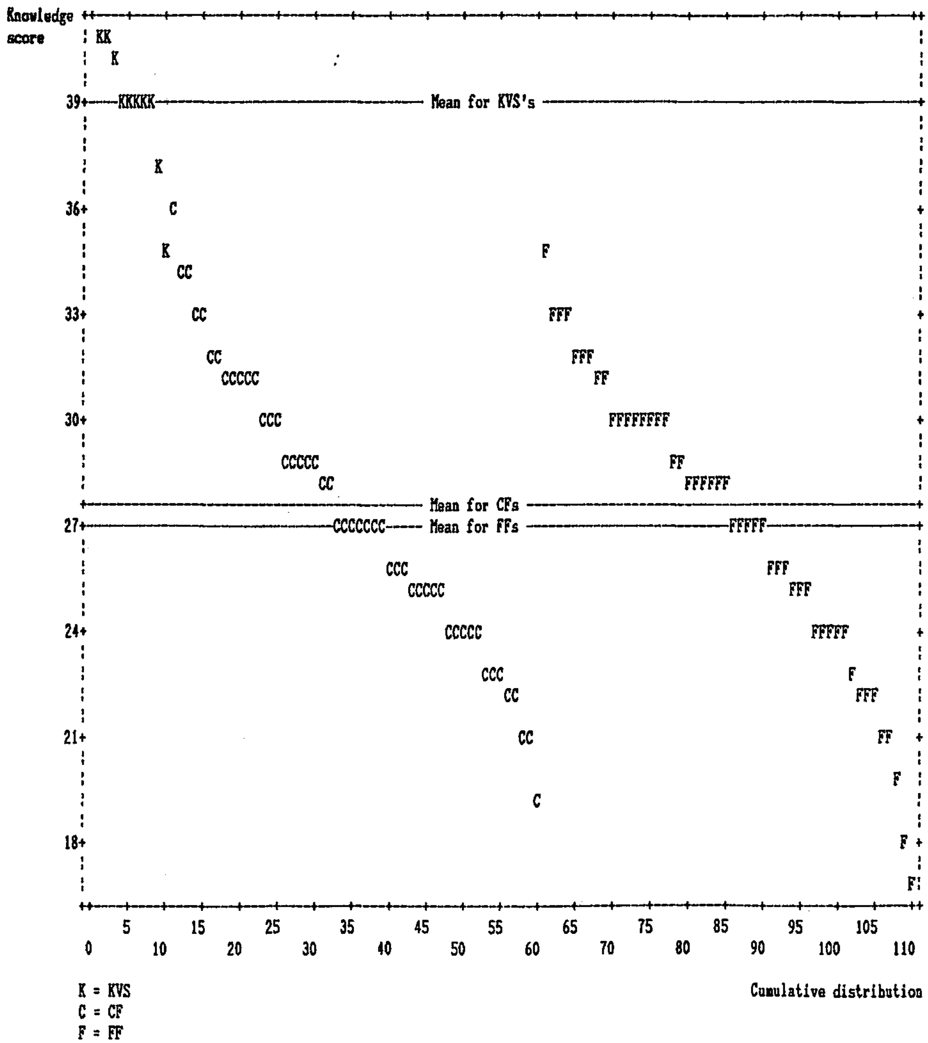


Table 10.3: Knowledge variation at different levels

	Levels						Two-tailed probability		
	KVSs		CFs		FFs		KVSs vs. CFs	KVSs vs. FFs	CFs vs. FFs
Knowledge measure	Mean	SD	Mean	SD	Mean	SD			
1	2.90	0.316	2.46	0.930	2.46	0.813	0.001	0.006	1.000
2	6.60	0.516	3.88	1.206	4.12	1.507	0.000	0.000	0.382
3	5.40	0.843	3.86	1.654	3.82	1.508	0.000	0.000	0.900
4	8.40	0.699	6.56	1.382	6.50	1.693	0.000	0.000	0.896
5	6.60	0.699	4.52	1.632	3.86	1.355	0.000	0.000	0.030
6	4.80	0.422	3.04	0.989	3.12	1.100	0.000	0.000	0.703
7	4.20	0.919	3.02	0.869	3.16	0.738	0.003	0.006	0.387
8	38.90	1.792	27.32	3.856	27.04	4.082	0.000	0.000	0.752

N: KVSs = 10, CFs = 50, FFs = 50

10.5.2 Significance of knowledge variation at different levels

In order to further test the original hypothesis of a large differential in knowledge between KVS, CF, and FF, the scores were subjected to a t-test. Table 10.3 shows the results.

Table 10.3 demonstrates that the difference between the KVS's score and the farmers' score is generally significant. The only measure on which CFs scored significantly higher than FFs was knowledge on pests, diseases and toxic conditions.

10.5.3 Discussion

Based on the above results, the knowledge dissemination process in the T&V system can partly be explained. For many recommendations and practices, the KVSs have a significantly higher knowledge than the farmers. Further, CFs and FFs have more or less the same level of knowledge. Hence, one general pattern of knowledge dissemination can be observed in the T&V context.

The messages were poorly transmitted even to the CFs' level. This leads to reject one of the hypotheses made in relation to the second research problem. As the bi-weekly training is of refresher type, KVSs have the opportunity to upgrade their knowledge. This may be one of the reasons that KVSs have attained higher knowledge score. The following illustrations come from a case material which provide some insight to the interfaces at the three levels.

A Contact Farmer comments,

I know that I have been selected as a contact farmer. Normally, the KVS comes to me once a month. He has not conveyed any special message or advice for this season but last season he told me something about insecticides. I passed the message to other farmers when they asked. Generally, I am neither interested in giving messages to other farmers nor in visiting their houses. I have not observed any difference in the present extension system!

A Follower Farmer comments,

I meet extension people only at the pre-seasonal meetings which are held just before the cultivation season. If I face a problem, I normally go to the Agricultural Services Center. I have heard about Contact Farmers, but I do not know who they are. None of the farmers came to me with any messages.

10.6 Discriminant analysis

The formal T&V system works on two distinct categories of clientele, CFs and FFs. They are supposed to make two levels so as to facilitate serial communication. The knowledge conveyed at the fortnightly training sessions to the extension workers is expected to be disseminated through these steps. However, the findings reveal that that CFs and FFs belong to one group with regard to knowledge. In order to test further this conclusion, a discriminant analysis has been carried out. First, a discriminant function has been computed by taking the seven knowledge measures as its components. Table 10.4 presents the results.

Table 10.4: Correlation between discriminant function and discriminating variables

Knowledge measures	Discriminant function
1. High yielding rice varieties	0.00000
2. Pre-seed treatments	- 0.30509
3. Plant establishment practices	0.04386
4. Chemical fertilizer application	0.04561
5. Pests, diseases and toxic conditions	0.76342
6. Weed control	- 0.13271
7. Weights and measures	- 0.30129

Only knowledge on pests, diseases and toxic conditions (measure 5) loads on the discriminant function. Pre-seed treatments (measure 2) and weights and measures (measure 7) also add some loading to it. Generally, however, only the discriminant variables which have correlations above 0.40 are considered significant.

This discriminant function has been utilized to predict the two farmer groups. Table 10.5 illustrates the results. It reveals that only 62 per cent of the CFs and 58 per cent of the FFs could be classified correctly. In total, it correctly classifies only 60 per cent of the cases. This confirms that farmer knowledge is a variable which is more or less the same for CFs and FFs.

10.7 Construction of a knowledge index

The final part of this chapter is devoted to correlations between farmer knowledge and some selected variables. To do so, an attempt has been made to construct a **knowledge index**. This refers to a general knowledge scale which can be used as a dependent variable in subsequent analysis. First, a reliability analysis was carried out to select the knowledge measures to construct a knowledge index. Table 10.6 illustrates the results of the reliability analysis.

Table 10.5: Classification of CFs and FFs based on the discriminant function

Actual knowledge groups	No. of cases	Predicted Knowledge groups	
		1	2
1 (CFs)	50	31	19
		62%	38%
2 (FFs)	50	21	29
		42%	58%

Percentage of grouped cases correctly classified = 60%

Step 1 of table 10.6 reveals that the reliability coefficient is 0.3112. However, once the measures 2 and 5 are deleted from the analysis the reliability coefficient can be improved to 0.3445 and 0.3543 respectively. Hence, these two measures were removed from the analysis and step 2 shows the results. It demonstrates that, while doing so, the overall reliability coefficient has improved from 0.3112 to 0.3951. In fact, this is a significant increase. Further, step 2 implies that the reliability coefficient can be increased to 0.4377 by drawing measure 6 from the analysis. Step 3 shows the results. In fact, this is an acceptable standard for reliability and further, removal of the rest of the components does not add much to the reliability coefficients. The removed knowledge measures were put together for reliability analysis and step 4 presents the results. It reveals that the reliability coefficient is only 0.1909. Such a low coefficient does not permit to use of these knowledge measures as components to the knowledge index. Thus a knowledge index can be constructed with knowledge measures 1,3,4, and 7 which gives an acceptable reliability coefficient of 0.4377.

10.8 Factor analysis

A factor analysis has been carried out to understand the groupings of different knowledge measures. This allows us to recognize the variables which have some mutual relationships. Table 10.7

Table 10.6: Results of the reliability analysis

	SCALE MEAN IF ITEM DELETED	SCALE VARIANCE IF ITEM DELETED	CORRECTED ITEM-TOTAL CORRELATION	SQUARED MULTIPLE CORRELATION	ALPHA IF ITEM DELETED
STEP 1					
Measure					
1	24.7200	13.8400	.1589	.0591	.2722
2	23.1800	13.4622	.0303	.0280	.3445
3	23.3400	10.9741	.2081	.0824	.2184
4	20.6600	11.6610	.1615	.1093	.2570
5	22.9900	12.9393	.0316	.0641	.3543
6	24.1000	13.6667	.1133	.0274	.2893
7	24.0900	13.0322	.3342	.1396	.2048
ALPHA =	.3112	STANDARDIZED ITEM ALPHA =	.3593		
STEP 2					
Measure					
1	16.5300	8.7567	.2144	.0564	.3429
3	15.1500	6.3914	.2192	.0738	.3359
4	12.4700	6.1708	.2862	.0930	.2599
6	15.9100	9.1938	.0535	.0084	.4377
7	15.9000	8.5960	.2905	.0941	.3077
ALPHA =	.3951	STANDARDIZED ITEM ALPHA =	.4107		
STEP 3					
Measure					
1	13.4500	7.3611	.2282	.0564	.3955
3	12.0700	4.9546	.2511	.0733	.3808
4	9.3900	5.0282	.2759	.0863	.3415
7	12.8200	7.2198	.3064	.0939	.3516
ALPHA =	.4377	STANDARDIZED ITEM ALPHA =	.4723		
STEP 4					
Measure					
2	10.3600	4.8994	.0268	.0115	.2539
5	10.1700	3.9607	.1022	.0501	.1399
6	11.2800	5.2541	.1217	.0164	.1170
7	11.2700	5.6536	.1613	.0417	.0991
ALPHA =	.1909	STANDARDIZED ITEM ALPHA =	.2232		

Table 10.7: Rotated factor matrix on knowledge measures

Knowledge measures	Factor 1	Factor 2	Factor 3
1	.61565	-.11940	-.04722
2	.01628	-.17775	.86658
3	.59408	.02496	.22601
4	.68191	.02359	-.12075
5	-.11539	.87755	.00274
6	-.00494	.31247	.52157
7	.55192	.51381	.05326
Total variance explained	21.6%	16.0%	15.0%

presents the rotated factor matrix.

Table 10.7 shows that the knowledge on HYVs (measure 1), plant establishment practices (measure 3), chemical fertilizer applications (measure 4) and weights and measures (measure 7) tend to load on factor 1. These four components of farmer knowledge can be considered as one factor. Next, knowledge on pests, diseases and toxic conditions (measure 5) and weights and measures (measure 7) can be regarded as the second factor as they load significantly on the second function. Finally, farmer knowledge on pre-seed treatments (measure 2) and weed control (measure 6) load on the third function. Therefore, these two knowledge measures make up a third factor.

The relation between the significant knowledge variables in factor 1 can be explained as follows. As many farmers are using HYVs in the district, it can be assumed that farmers who are knowledgeable on this innovation are the ones already adopting it. The HYVs are highly responsive to chemical fertilizers. Further, many of the varietal recommendations come with fertilizer recommendations and such varieties bring significant profits only when treated with chemical fertilizers. Hence, there is vital correlation between these two innovations which leads farmers to acquire higher knowledge on them at the same time. Next, HYVs need careful attention.

This means that relevant cultural practices such as weed control, fertilization, pests and diseases control etc. have to be done more frequently. The fields planted with new planting techniques facilitate easy operation of such cultural practices. Hence, it can be expected that farmers who have a higher knowledge on above described knowledge measures are equally good in their knowledge on plant establishment practices. Finally, knowledge on fertilization and plant establishment methods presumes knowledge about weights and measures. As an example, in fertilizer applications, the recommended quantity per acre should be correctly measured. Therefore, knowledge on weights and measures is grouped with other knowledge variables described above.

Factor 2 implies that knowledge on pests, diseases and toxic conditions (measure 5) and weights and measures (measure 7) are knowledge components which are related. This correlation is a distinct one. Higher knowledge on pests, diseases and toxic conditions reflects a higher knowledge on their control measures. The correct application of control measures essentially depends on the knowledge of weights and measures. Hence, it can be assumed that farmers who have higher knowledge on above control measures have acquired higher knowledge on weights and measures.

A direct relation between the two knowledge components in factor 3 cannot be so easily explained. However, one explanation is that the knowledge on pre-seed treatments facilitates good stock of seeds to plant but once the farmer gets a higher yield, often the credit will go to other innovations such as fertilizers. In other words, yield increases as a result of pre-seed treatments remains unobserved. The same is true for weed control measures. It is evident that weeds can reduce yields up to 60 per cent. But once a farmer applies control measures, the percentage yield saved cannot be easily found out.

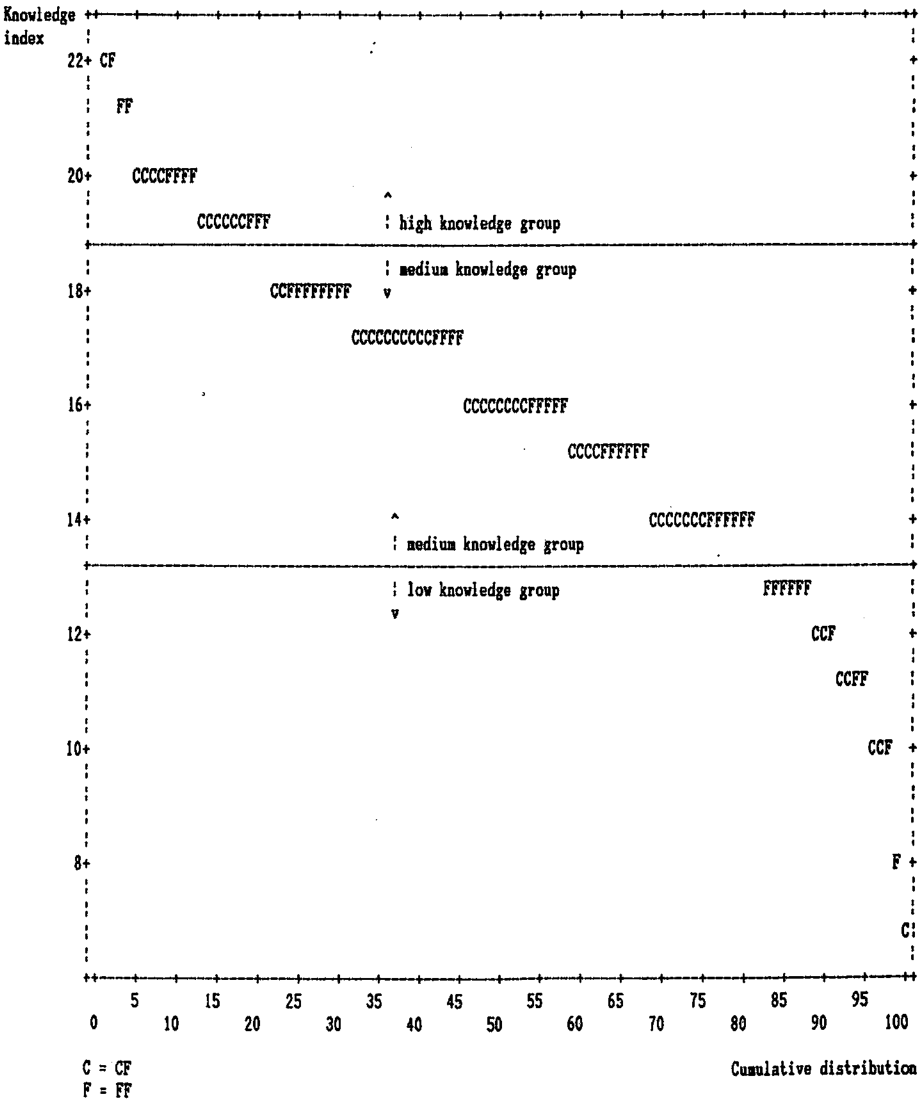
On the above findings, it was decided to construct the index with knowledge measures which load on the factor 1 (measures 1,3,4 and 7). In fact, the findings of the reliability analysis and the factor analysis give similar results. The scores attributed to knowledge measures 1,3,4, and 7 were added to make the knowledge index. Fig. 10.4 shows the distribution of farmers across the knowledge index. It approximates a normal distribution so that it permits to use the index as a scale to measure farmer knowledge. Using this distribution, three knowledge groups were made, on arbitrary cut-off points. These three groups have the score ranges of 0 to 13, 14 to 18 and 19 to 22, respectively.

10.9 Farmer knowledge and associated variables

Farmer knowledge was cross-tabulated with other variables. The outcomes provide a basis for understanding the knowledge dissemination process in the extension system. The degree of association has been tested with Kendall's Tau test. As there is no difference found in knowledge with respect to two farmer types — CFs and FFs, they were considered as one group. Further, as demonstrated in chapter 9, the sample used approximates the characteristics of a random sample. This prompted our use of significance tests.

The results show that middle aged farmers are more knowledgeable than the other two age groups. This may be due to the fact that middle aged farmers have more farming experience than the young ones. On the other hand, even though the older farmers have more experience than the middle aged farmers, the older ones are not much inclined to receive new knowledge. Kendall's Tau (B) test shows that the association is not statistically significant (Appendix 5). In many instances, formal education is correlated to farmer knowledge. Hence, this study too, considers formal education. Farmers were classified into three groups, according to their level of formal education and cross-tabulated with knowledge groups (Appendix 6). Many (47%) of the farmers have obtained middle level formal education, but 43 per cent of them have received only primary education. Among the low knowledge group, 42 per cent and 47 per cent were represented by low and middle level educated farmers respectively. On the other hand, among the high knowledge group, 52 per cent comprises middle level educated farmers.

Figure 10.4: Distribution of farmers across the knowledge index



Further, 40 per cent of the higher educated farmers fall into the group of high knowledge level. The Kendall's Tau (B) test indicates a positive association between farmer knowledge and formal education but it does not show statistical significance.

At the village level, farmers have an opportunity to keep extension contact with Agricultural Instructors (AIs), KVSs, Cultivation Officers (COs) and CFs. In fact, there are other sources of direct or indirect contacts on their farming matters but the above mentioned were considered as formal contacts in this study. Next, the source ranked first by a farmer was taken as his main contact. Knowledge levels and the source of extension contact were cross-tabulated (Appendix 7). Results show that 64 per cent of the farmers keep contact with KVSs. Farmers who do not keep any contact with above mentioned sources fall into the groups of low and medium level of knowledge, representing 33 per cent and 67 per cent, respectively. These findings indicate that KVSs are important elements in the knowledge dissemination process. However, the Kendall's Tau (C) test does not indicate any statistically significant association between farmer knowledge and the type of extension contact.

The variable KVS visit frequency was classified into five classes as, 'no visits', visit made once in three months, once in two months, once a month and once in two weeks. The last class represents the formal standard of the T&V model. A cross-tabulation was done for knowledge levels and KVS visit frequencies (Appendix 8). The majority of the farmers (53%) in the low knowledge group has not had any visit or had been visited only once in three months by the KVSs. In the medium knowledge group, 51 per cent of the farmers were visited by the KVSs either once in two months or once in a month. In contrast, for 62 per cent of the farmers in the high knowledge group, visits were made either once a month or once in two weeks. Kendall's Tau (C) test shows a significant positive association.

Generally, farmer field trials are conducted under the supervision and guidance of research and extension personnel. Such field trials serve as method or/and result demonstrations. As they are held in the farmers' fields, mostly throughout the season, farmers can receive greater comprehension of a particular recommendation or cultural practice. Hence, it was assumed that farmer field trials make an impact on knowledge levels. In order to reveal the association, these two variables were cross tabulated (Appendix 9). Results show that only 23 per cent of the farmers have had field trials. Among the farmers with field trials, only 13 per cent falls into the low knowledge group while 39 per cent comes from the high knowledge group. The Kendall's Tau (C) test implies a positive significant association.

Much of the early extension literature shows that innovative farmers have acquired more knowledge on new technologies. I have provided a detailed description on this in chapter 7. The knowledge levels were cross-tabulated against adopter categories. The low knowledge group is represented by 37 per cent innovators, 53 per cent middle adopters and 11 per cent late adopters. The high knowledge group comprises of 29 per cent innovators, 57 per cent middle adopters and 14 per cent late adopters. The test of statistics shows no significant association between knowledge levels and innovativeness (Appendix 10). Hence, it can be concluded that even the less innovative ones also acquired knowledge on recommendations, but due to some external constraints, most probably due to limitations in resource access, they refrain from adoption of innovations.

Chapter 11

CONCLUSIONS

This study has looked at some aspects of the actual functioning of the Training and Visit (T&V) System of Agricultural Extension at the field level. In the past fifteen years, the T&V system of extension management, emphasising regularity of time-bound extension visits to designated Contact Farmers and regular and time-bound training of village level workers by Subject Matter Specialists, who in turn receive regular training from research specialists, has been introduced in over 40 countries. World Bank loans of over $ 2.4 billion have been made to facilitate its instalment by paying for houses of extension workers to ensure coverage, vehicles and other means of transport for field and supervisory personnel to ensure regularity of visits, technical assistance to train staff and help install the system. Under pressure from the World Bank, linkage mechanisms between research and extension have been established to ensure a regular flow of information of field problems 'up' and research findings 'down'. The study therefore examines the most important effort to improve agricultural extension in developing nations in recent years, an effort in which many countries have invested a great deal of money which they have loaned on commercial terms. This study is one of the still limited empirical studies of the actual functioning of the T&V system at the field level.

As such, this is not a definite study of the T&V system. It adds to our knowledge by providing another case, the case of Sri Lanka, or rather, Matara, only one district in Sri Lanka. Even though the farmers studied were rice farmers, most grew other crops or had part-time off farm employment. In fact, paddy farming seems to have become somewhat of a part-time job in the district. Rice farming was studied because the T&V system adopted in the district focuses on paddy and does not address the total and admittedly complex farming system.

This chapter draws together the most important findings from the study. It concludes by making a number of suggestions for further research.

Major Findings

1.

The T&V system focuses on rice, as mentioned above. Sri Lanka is beginning to face a glut in rice production even though the irrigated areas newly established under the Mahaveli Scheme have not yet come into full production. As a result of this glut, relative prices of paddy will drop sharply. This will alter the calculations of internal rates of return on investments in extension and research. The emphasis of the Ministry of Agriculture is shifting rapidly to diversification crops, such as pulses. The study found no evidence that the T&V system is applied to extension on diversification. The system seems incapable of being adapted to changing conditions. This is, of course, not inherent in the T&V system. It just seems that the T&V system in Matara is not tooled up to meet changing requirements.

2.

Since the T&V system has been formally adopted by the Sri Lankan extension service, a very elaborate and excellent description exists of the functioning of the system in Sri Lanka and of the way it addresses the major development issues in a forward- looking manner.

If one asks extension staff at national, provincial or district headquarters how extension works in Sri Lanka, the formal description provides the answer, be it that some misgivings exist about the extent to which small farmers are actually reached by extension messages.

One of the main conclusions of this study is what **actually** happens in the field bears little resemblance to the **formal system** in a number of very important aspects.

3.

One of the important aspects of the T&V system is the regularity of time-bound visits to designated Contact Farmers (CFs), strategically selected to blanket an area with impact points where the extension worker can be found according to a well known visiting schedule so that the 'Follow Farmers' (FFs) to a CF know when to find the extension worker.

In Matara the Village Extension Workers (KVSs) were unable to follow the schedule assigned to them. In practice the frequency and regularity of visits differ greatly from the formal schedule. The number of farm families assigned to a VEW seems unmanageable but this number is increasing with the reduction of KVS divisions for budgetary reasons. The country seems unable to keep up the system installed under the conditions of the loan.

The CF-FF differentiation is supposed to partly provide a two-step flow of information, in that CFs are expected to diffuse the knowledge they gain from direct contact to FFs. Partly also, FFs are supposed to come and see the KVS when he visits the CF. The special role of the CF assigned to him in the formal system could not be observed in practice. A number of CFs on the KVS list could not be contacted. The KVS usually did not seem to follow the schedule. What's more, many CFs experienced difficulties with the content and complexity of the messages which were passed on to them by the KVSs. The majority of the farmers, that is including the FFs, still regarded the KVS as their main source of direct information. Little interaction between CFs and FFs could be observed, while there is little evidence of a flow of information from FF to CF to KVS. There was little evidence of farmer problems reaching research.

4.

An important aspect of the formal system established under the T&V principles is the serial flow of extension messages. At a fortnightly meeting, Subject Matter Officers (SMOs) convey the extension messages deemed to be appropriate for the coming two weeks. Given the local farming calendar, the KVSs, pass the messages on to CFs and so on, following the predetermined pathways.

The study reveals however, that the messages do not come down to the farmer's level within the designated period. A major reason for this is that the messages are not fully appropriate to the conditions which the extension workers meet in the field. Farmers follow different cropping calendars. Hence, regardless of the messages given at the higher levels, KVS decide what knowledge will be extended to whom at what moment. These decisions are taken at the level of the Agricultural Service Center and knowledge is released when required. Thus one of the great presumed advantages of the T&V system: its ability to use barely trained Village Extension Workers effectively through a regular updating of the information they are to pass in the coming period, does not work in Matara. Instead, the fortnightly training sessions are refresher courses during which extension workers acquire information which they store for future reference. Therefore, extension workers make use of the processes of **storage** and **retrieval** of information. Since the formal T&V system does, however, not recognize these processes, it does not assist in making them more effective (for example by providing written information to which extension workers can refer back).

In the present situation, however, this does not seem to be much of a handicap. Most of the messages provided at the fortnightly meetings are repetitions and do not really add new knowledge. This is partly because the SMOs who provide the fortnightly training have no regular contact with research.

5.

One of the key elements of the T&V system as intended is the regular contact between extension and research. In fact, the T&V system can be said to increase the interconnectedness between the elements of the agricultural knowledge system (AKS): farmers, extension and research institutions. In actual practice, the improved linkage between research and extension was not much in evidence.

The formal bodies installed to strengthen the research- extension interface, the Regional Technical Working Group (RTWG), the Regional Extension Dialogue (RED) and the Adaptive Research Unit (ARU) were not functioning optimally.

These formal bodies need to be improved. The Regional Technical Working Group (RTWG) meeting itself provides only for a presentation of the progress made during the previous season and of the targets and proposals for research, extension and training for the coming season. There is no presentation for on-going research or planned research at the Regional Research Center (RRC). Moreover, there is hardly any discussion on the presentations made by the extension personnel, so that the impression exists that each district can go with its own proposal without much cooperation between other districts or research. Some of the problems presented to research do not seem to be pressing problems for a significant number of farmers. Research Officers (ROs) are reluctant to accept research problems suggested by extension. Further, fewer and fewer experiments for extension are being done every season. At the Research Extension Dialogue (RED), extension hardly obtains new knowledge from research. On the other hand, ROs do not receive satisfactory feedback from extension. The duration of RTWG has been reduced from two days to one and the frequency of RED has been reduced from once a month to once in two months. This can be seen as a modification to the formal system but it reduces the strength of the research-extension liaison. The Adaptive Research Unit (ARU) though established under that name, did not carry out any adaptive research.

The Subject Matter Officers (SMOs) are not making any link between research and extension as they have very little access to research. Due to the same reason, they have very limited opportunity to advance their knowledge on respective fields of specialization.

One important point to be made is that the Regional Research Center did not represent Matara's ecological zone. Another research station would have been more appropriate, but for unknown reasons, Matara was not assigned to that station.

In all the research-extension linkages in the Matara case leave much to be desired, highlighting the fact that the T&V system itself addresses only the extension component and does not include applied and adaptive research, even though most people agree this to be one of the most serious weaknesses of T&V. As a result, the regular flow of new information to extension, one of the very foundations on which the economic viability of World Bank loans for T&V is based, is not ensured.

6.

Knowledge measures indicate that the KVSs have gained sufficient knowledge on the recommendations which were tested. The refresher type fortnightly training provides an opportunity to upgrade their knowledge. However, a considerable knowledge gap exists between the KVSs' level and farmers' level, but there is hardly any knowledge gap between the two formal farmers types — CFs and FFs. Hence, the knowledge dissemination process has not contributed much to advance the farmers' knowledge on extension recommendations. But farmers may have their own knowledge of which research and extension are still not aware.

Knowledge level has a positive association with KVSs' visit frequency. Hence, KVSs' visit frequency is an important variable in the process of knowledge dissemination. The association between knowledge level and innovativeness is quite interesting. It seems that less innovative farmers equal the knowledge level of the innovative ones. Hence, it is apparent that all the farmers have the same level of knowledge for extension recommendations, but some farmers have become less innovative due to external constraints, mainly due to limitations in their access to resources.

7.

One of the important reasons for introducing T&V was to ensure greater equity in access to extension of the different farmer categories. The formal contact points established by the system, the Contact Farmers, were largely innovative farmers. These were visited with a higher frequency, as was the case in the conventional system and is, in fact, the case in most extension systems.

Innovativeness, indicated by the score on the adoption index, is clearly related to access to resources.

Suggestions for future research

1.

One of the most interesting issues for further research is the cause of the difference between the formal system and the way T&V is actually implemented in the field. Sims and Leonard (1988) speak of 'default' when describing the normal ineffective extension systems: the normal tendency to work with progressive farmers, the normal tendency for research and extension not to work together, the normal tendency for upward communication not take place and so on. That is, when no special effort is made, the default option is an ineffective extension service. One reason for the difference between the formal T&V system and actual practice could, therefore, be looked for in the management practices which have been applied and the incentives which were operative in the field. On the other hand, the formal T&V system might be so inappropriate to the field situation that it is not a question of good management to introduce it, but rather to adopt it.

A difference between the formal system and the actual field situation is hard to detect (Wagemans:1987). Little information from the field moves upward in the hierarchy. There is a general tendency to report the field situation conform the desired formal system. Figures of what actually happens in the field are hard to come by and close supervision of day-by-day activities of field workers is difficult. That is why a field study of the actual implementation of T&V is so important. Given the amount of money which countries invest and borrow on the strength of the logic of the formal system, it is disconcerting to discover that, in the field, extension is 'business as usual' and that the supposed benefits of a regular flow of new information to extension and farmers, and time-bound regular training and visits remain more or less illusionary.

Research to identify the causes of the differences between formal system and actual implementation would seem very important for identifying those measures which the government can take to improve the impact of its investment, or avoid wasting further money. Such research would also have to look into the reasons why the T&V system is not applied to new challenges, such as diversification of rice production through the introduction of pulses, etc.

2.

The theory of Agricultural Knowledge Systems emphasises that agricultural research, extension and farmers form a coherent system and that pay-off from research and extension only comes when the entire AKS functions synergically. The formal T&V system undoubtedly contributes to improve the functioning of the AKS by increasing the inter-connectedness of the components in the system: regular and time-bound contact between research and extension and regular and time-bound contact between extension and farmers. However, the T&V system is still very much an **extension** system. It does not specify the required articulation of institutions on the theory-practice continuum. It does not regulate the flow of information from farmers to research planning. It says nothing about the incentives and mechanisms to make the entire AKS work. It seems important to develop practical and workable models of the entire AKS for implementation in the field.

An important corollary is the question how the entire AKS can be managed as a system, especially if the different components are the responsibility of different departments, directorates or even ministries. What are the tools for such system management? What management information systems are required for running an AKS synergically?

3.

A staggering problem in bureaucracies is the complete lack of willingness to acknowledge the importance of farmer information and/or influence over the system. Where commercial institutions, also in Asia, are quite ready to accept a strong market orientation in their entire set of operations, agricultural research and extension remain bluwarks of bureaucratic top-down thinking in which the farmer is considered as the lowest civil servant, instead of a customer to be served properly if one wants to get any returns.

It is easy to use terms such as 'top-down' and 'bureaucracy'. However, if one wants concrete 'stress points' for management interventions, a much more thorough analysis of the mechanisms and causes is required.

Appendices

Appendix 1

Figure 11.1: The rice acreage, average yield and production, 1952-85

YEAR	AREA ACRES	SOWN AREA ACRES	HARVESTED GROSS ACRES	AREA NET ACRES	AVERAGE YIELD bu/ac	PRODUCTION BUSHELS '000
1952	964,484	1,161,869	1,101,871	936,590	30.80	28,900
53	964,484	1,048,228	951,481	808,758	27.00	21,900
54	971,546	1,253,835	1,201,726	1,021,467	30.02	31,100
55	1,031,616	1,346,824	1,285,348	1,092,545	32.45	35,700
56	1,071,546	1,177,716	1,052,156	894,333	30.03	26,900
57	1,093,554	1,207,623	1,138,293	967,549	32.35	31,280
58	1,098,384	1,382,184	1,239,182	1,053,305	34.40	36,600
59	1,133,096	1,330,219	1,228,052	1,043,844	34.91	36,400
60	1,160,097	1,468,406	1,392,861	1,183,931	36.38	43,000
61	1,180,018	1,471,983	1,406,822	1,195,798	36.13	43,100
62	1,197,103	1,535,932	1,492,263	1,268,423	37.90	48,000
63	1,230,491	1,561,920	1,525,343	1,296,541	37.91	49,200
64	1,249,156	1,585,198	1,534,720	1,304,512	38.69	50,500
65	1,272,664	1,455,349	1,242,631	1,056,237	34.32	36,300
66	1,323,317	1,616,883	1,512,312	1,285,465	35.62	45,700
67	1,331,231	1,638,931	1,566,967	1,331,922	41.27	54,900
68	1,349,056	1,742,469	1,634,138	1,389,017	46.49	64,500
69	1,385,709	1,709,152	1,539,425	1,308,511	50.33	65,860
70	1,408,922	1,875,557	1,775,897	1,509,512	51.30	77,447
71	1,419,195	1,793,611	1,714,345	1,457,193	45.91	66,895
72	1,448,403	1,794,572	1,578,929	1,342,089	46.87	62,901
73	1,439,874	1,792,102	1,659,780	1,410,813	44.58	62,900
74	1,498,487	2,038,058	1,969,481	1,674,059	45.65	76,794
75	1,533,568	1,719,370	1,475,784	1,259,417	44.04	55,315
76	1,534,454	1,788,891	1,570,281	1,334,739	44.90	60,034
77	1,588,543	2,046,192	1,933,066	1,643,106	48.88	80,387
78	1,625,474	2,163,094	2,074,261	1,785,667	50.83	90.605
79	1,614,012	2,090,197	1,951,047	1,722,027	53.30	91,886
80	1,628,334	2,101,871	2,030,194	1,799,962	56.83	102,237
81	1,654,847	2,180,863	2,081,796	1,841,727	57.84	106,845
82	1,696,986	2,087,170	1,843,405	1,632,506	62.36	103,312
83	1,726,304	2,039,808	1,922,574	1,705,047	70.23	119,027
84	1,735,573	2,447,547	2,189,568	1,943,937	59.67	115,968
85	1,744,272	2,176,233	2,136,662	1,898,273	67.19	127,552

Source : Nanayakkara:1987:02

Appendix 2

AGRICULTURAL EXTENSION AND RICE SMALL FARMERS

Questionnaire for General Farm Population

No:..................
AI Range:............
KVS Division:........

I. General Information

1. What is your name? ....
2. How old are you? ....
3. Sex? M/F Civil status? S/M/D
4. What is the paddy extent you cultivate? ......
   Owned ...... Ande (Rented in) ......
   Rented out ...... Other ......
5. What is the approximate yield you get per acre? ......
6. Does your paddy affected by floods? Yes/No
7. If yes, how often? ....
8. What is the paddy variety you cultivate? ....
9. Who recommended this?
   a) AI b) KVS c) CO
   d) CF e) FF f) Any other
   g) None
10. If your field is affected by flood, do you think that this variety is suitable? Yes/No
11. Have you ever ask your extension worker (KVS) to find a suitable variety? ....
12. Are you familiar with your KVS? Yes/No
13. How often you meet him?
   a) Once in 2 weeks b) Once a month
   c) Once in 2 months d) Once in 3 months
14. Does he convey any messages on farming practices? Yes/No
15. If yes, how far these messages are useful to solve your problems?
   a) Very useful b) Some are useful
   c) Not relevant
16. Whom do you contact regarding your farming problems?
   a) AI b) KVS c) CO
   d) CF e) FF f) None

17. If you are a CF do you know the role as a CF? Yes/No
18. How many FFs are assigned to you? .....
19. Do you convey the KVSs messages to them?
    a) To all b) To half
    c) To few d) None
20. To what extent can you keep the contents of the KVS's messages?
    a) Fully b) Half c) Difficult
21. If you don't convey the message to all of them, what is the reason?
    a) No time b) No incentive
    c) They are not familiar with CF
    d) They do not listen
22. Do the FFs bring their problems to you?
    a) Many b) Half
    c) Few d) Not at all
23. How do you solve these problems?
    a) By yourself b) Discussing with experienced farmers
    c) Convey to KVS d) Convey to AI
24. How do you get information regarding farming practices?
    a) AI b) KVS
    c) Radio d) News papers
    e) Private dealers f) Other farmers
25. In general, extension work today, is?
    a) More satisfying b) Less satisfying
    c) Remaining the same
26. Do you know your FFs?
    a) All b) Half
    c) Few d) None
27. Do you have a list of them? Yes/No
28. How many FFs do you have to serve? ....
29. How far is the ASC from your residence? ....
30. Do you participate in pre-seasonal meetings? Yes/No
31. Have you participated in any farmer training classes? Yes/No

    If yes, please specify

	Place	Duration	Year
a)	....	....	....
b)	....	....	....
c)	....	....	....

32. If you are not a CF do you know your CF? ....
33. How did he get selected? ....

34. Do you discuss your problems with extension personnel?
    a) AI b) KVS c) CO
    d) CF e) None
35. Have you received reasonable solutions to your problems from them? Yes/No
36. Did you observe any change in extension service during the last five years?
    a) Positive b) Negative
    c) Remained the same
37. Do you receive any message from CF? Yes/No
38. If yes, how often?
    a) Every week b) Once in 2 weeks
    c) Once a month d) Once in 2 months
    e) Once in 3 months
39. Do you convey your problems to CF? Yes/No
40. Do you recognize him as a CF? Yes/No

II. Socio-economic Variables

41. Where is your paddy field located?
    a) Near by the house
    b) At a distance from the house
42. If at a distance, how far from your house? ....
43. To what extent do you cultivate paddy, Yala \& Maha seasons?

	Yala	Maha
Owned	....	....
Ande	....	....

44. What are the problems you have faced in paddy cultivation in each blocks in each seasons?

Block	Season	Problem
a)	....	....
b)	....	....
c)	....	....

45. Did you practice any trials in your paddy fields? Yes/No
46. If yes, what are they? ....
    ....
47. How far is it successful?
    a) More successful b) Less successful
    c) Remained the same
48. If not, what are the problems for not using trials?
    ....
49. Did you see any experimental trials in your area? Yes/No

50. If yes, how useful are they for your farming practices?

    a) Very useful   b) Some are useful
    c) Not relevant

51. How do you obtain water for your paddy fields?

	No of blocks	Area
a) By irrigation	....	......
b) Rainfed	....	......

52. What percentage of money do you spend at each operation in paddy cultivation?

	percentage
a) Ploughing	......
b) Broadcasting and transplanting	......
c) Weed control	......
d) Pest control	......
e) Harvesting and threshing	......

53. Do you have institutional credit facilities?   Yes/No
54. If yes, do you think it is enough for your cultivation practices? ....
55. If not, how much credit would be enough ? ....
56. Do you get seed paddy ?   Yes/No
57. If not, what are the problems for not receiving?

    a) Not available at the correct time
    b) Poor extension services
    c) Lack of money   d) Not needed   e) None

58. What seed pre-treatments do you practice?

    a) ....
    b) ....
    c) ....

59. How many hours do you soak seeds? .....
60. Do you know the dapog nursery? Yes/No
61. Do you practice it? Yes/No
62. What are the problems in this method ? ....
    ....
63. How many days do you keep seedlings in the dapog nursery? ....
64. If you broadcast, what is the seed rate?

    a) Per acre ....
    b) Other ....

65. If you transplant, what is the distance?   ....
66. What is the depth of planting?   ....
67. What is the rate of seedlings per hill?   ....
68. What is the nursery area required? (wet/dapog)

    For one acre field ......
    Other ......

69. What is the seed rate required for wet/dapog nurseries?
    For one acre field ......
    Other ......
70. What are the implements you have?
    a) Four wheeled tractor
    b) Two wheeled tractor
    c) Thresher
    d) Weeder
    e) Harrows
    f) Sprayers
       Knapsack ......
       Power sprayer ......
    g) Other
71. Do you know the resistant paddy varieties? Yes/No
72. If yes, are you cultivating those?
    a) Hopper resistant variety ......
    b) Gall midge resistant variety ......
    c) Iron toxicity resistant variety ......
    d) Water logging resistant variety ......
    e) Other ......
73. Do you use high yielding varieties? Yes/No
74. If yes, what are they? ....
75. Do you use early maturing varieties? Yes/no
76. If not, what are the problems for not using? ....
    ....
77. Do you apply chemical fertilizers? Yes/No
78. If yes,

	Quantity	as a % of recomm.
a) Basal dressing (5:15:15)	....	....
b) 1st top dressing (Urea)	....	....
c) 2nd top dressing (TDM)	....	....

79. Do you apply organic manure? Yes/No
80. If yes, how much do you apply per acre? ....
81. How far pest and diseases have affected your paddy field?
    a) Fully
    b) Half
    c) Few
    d) Not at all
82. Do you control pests and diseases by chemical application? Yes/No
83. If not, what are the problems?
    a) Lack of capital
    b) Not available at the correct time
    c) Poor extension service
    d) Following traditional methods
    e) None

84. If yes, what chemicals used against pests and diseases?

	chemical	problem	dosage	stage
a)	....	....	....	....
b)	....	....	....	....
c)	....	....	....	....
d)	....	....	....	....
e)	....	....	....	....

85. How far do you have to go to buy these chemicals?.......
86. Can you buy these at retail prices? Yes/No
87. Do you impound water to control weeds? Yes/No
88. If yes, how?
    a) Impound fully b) Impound half
89. Who told you about water impounding?
    a) AI b) KVS c) CO
    d) CF e) None
90. How do you recognize a BPH attack? ....
91. Did you have this attack? Yes/No
92. If yes, what treatments were used?

	treatments	dosage
a)	....	....
b)	....	....
c)	....	....

93. How far is it to a motorable road from your residence?
94. How far is the nearest market where you can by input and sell your products? ......
95. What are the problems regarding fertilizers?
    a) High price b) Unavailability
    c) Lack of capital d) Transportation problems
    e) Lack of knowledge f) Any other
96. What are the problems regarding institutional credit facilities?
    a) Too much formalities b) Lack of security
    c) Not provided in time d) High interest
    e) Difficult to repay f) Any other
97. What are the marketing problems?
    a) Low price b) Transportation
    c) Lack of marketing points/buyers
    d) Problems of quality standards

III. Indicators for Adoption Index

98. Do you transplant your field? Yes/No
99. If yes, from when?.................
100. Do you use dapog nursery? Yes/No
101. If yes, from when? ....
102. Do you practice chemical or mechanical weed control? Yes/No
103. If yes, from when? ....
104. Do you use high yielding paddy varieties? Yes/No
105. If yes, from when? ....
106. Do you clean stubble after the season? Yes/No
107. If yes, from when? ....
108. Do you use chemical fertilizers? Yes/No
109. If yes, from when? ....
110. Do you use chemicals for pests and diseases control? Yes/No
111. If yes, from when? ....
112. Do you use a thresher? Yes/No
113. If yes, from when? ....

Thank you

Date: ....

Appendix 3

AGRICULTURAL EXTENSION AND RICE SMALL FARMS

Questionnaire for Contact Farmers and Follower Farmers

No:................
AI Range:..........
KVS Division:......

I. General Information

1. What is your name? ....
2. How old are you? ....
3. Sex? M/F Civil status: S/M/D/W
4. Education, up to which grade? ....
5. What is the total extent you cultivate? ......
6. What is the paddy extent you cultivate? ......
   Owned ...... Ande(Rented in) ......
   Rented out ...... Other ......
7. What is the approximate yield you get per acre? ......
8. Is your paddy field affected by floods? Yes/No
9. If yes, how often? ....
10. What is the paddy variety you cultivate?

	variety	duration
I	....	....
II	....	....
III	....	....

11. Who recommended this?
    a) AI b) KVS c) CO
    d) CF e) FF f) Any other
    g) None
12. If your field is affected by flood, do you think this variety is suitable? Yes/No
13. Have you ever asked your extension worker (KVS) to find a suitable variety? Yes/No
14. Are you familiar with your KVS? Yes/No
15. How often do you meet him?
    a) Once in 2 weeks b) Once a month
    c) Once in 2 months d) Once in 3 months
    e) Not at all
16. Does he convey any messages on farming practices? Yes/No

17. If yes, how far these messages are useful to solve problems?
    a) Very useful   b) Some are useful
    c) Not relevant

Questions for Contact Farmers
=============================

18. Whom do you contact regarding your farming problems?
    a) AI   b) KVS   c) CO
    d) Other CF e) FF   f) None
19. Do you know the role as a CF?   Yes/No
20. How many FFs are assigned to you?   ......

21. Do you convey the KVS's messages to them?
    a) To all   b) To half
    c) To a few   d) None
22. Can you keep the contents of KVS's messages?
    a) Fully   b) Half   c) Difficult
23. If you don't convey the messages to all of them, what is the reason?
    a) No time   b) No incentive
    c) They are not familiar with CF
    d) They don't listen
24. Do FFs bring their problems to you?
    a) Many   b) Half
    c) Few   d) None
25. How do you solve your farming problems?
    a) By your self   b) Discuss with experienced farmers
    c) Convey to KVS   d) Convey to AI
    e) Any other
26. How do you get information regarding farming practices?
    a) AI   b) KVS
    c) Radio   d) News papers
    e) Private dealers   f) Other farmers
27. In general, extension work today is?
    a) More satisfactory   b) Less satisfactory
    c) Remain the same
28. Do you know all your FFs?
    a) All   b) Half   c) Few   d) None
29. Do you have a list of them?   Yes/no

Questions for Follower Farmers

30. Do you know your CF? ....
31. How has he been selected as a CF? ....
32. Do you discuss your problems with extension personnel?
    a) AI b) KVS c) CO d) CF
    e) Other farmers f) None
33. Have you received reasonable solutions to your problems from them? Yes/No
34. Do you observe any change in extension service during the last 5 years?
    a) Positive b) Negative c) Remain the same
35. Have you received any message from CF? Yes/No
36. If yes, how often?
    a) Every week b) Once in 2 weeks
    c) Once a month d) Once in 2 months
    e) Once in 3 months
37. Do you convey your problems to CF? Yes/No
38. Do you recognize him as a CF? Yes/No

II. Socio-economic Variables

39. How far is the ASC from your residence? ....
40. Do you participate in pre-seasonal meetings? Yes/No
41. Have you participated in any farmer training classes? Yes/No

    If yes, please specify

	Place	Duration	Year
a)	....	....	....
b)	....	....	....
c)	....	....	....

42. Where is your paddy located?
    a) Near by the house ....
    b) At a distance from house ....
43. If at a distance, how far from your house? ....
44. To what extent do you cultivate paddy in Yala \& Maha seasons?

	Yala	Maha
Owned	....	....
Ande	....	....

45. What problems have you faced in paddy cultivation in each seasons?

	block	season	problems
a)	....	....	....
b)	....	....	....
c)	....	....	....

46. Have you practised any trials in your paddy field? Yes/no
47. If yes, what are those?................................
    ....
48. If yes, how far are those successful?
    - a) very successful b) Less successful
    - c) Remain the same
49. If not, what are the problems for not using trials?

.....

    ....
50. Did you see any experimental trials in your area? Yes/No
51. If yes, how much are they useful for your farming practices?
    - a) Very useful b) Some are useful
    - c) Not relevant
52. How do you obtain water to your paddy fields?

	No. of blocks	area
a) By irrigation	....	....
b) Rainfed	....	....

53. What percentage of money do you spend at each operation in paddy cultivation?

	Rs.	percentage
a) Ploughing	....	....
b) Broadcasting or transplanting	....	....
c) Weed control	....	....
d) Pest control	....	....
e) Harvesting and threshing	....	....
f) Fertilizers	....	....
g) Others	....	....
Total	....	....

54. Do you have institutional credit facilities? Yes/No
55. If yes, do you think it is enough for your cultivation practices? ....
56. If not, what amount of credit is enough for your cultivation practices? ....
57. What are the problems regarding institutional credit facilities?
    - a) Too much formalities b) Lack of security
    - c) Not provided in time d) High interest
    - e) Difficult to repay f) Any other

58. Do you get seed paddy? Yes/No
59. If not, what are the problems for not getting?
    a) Not available at the correct time
    b) Poor extension service
    c) Lack of money d) No need
    e) None
60. What are the implements you have?
    a) Four wheeled tractors b) Two wheeled tractors
    c) Seeders d) Weeders
    e) Harrows
    f) Sprayer - Knap-sack sprayer
    - Power sprayer
    g) Other
61. Do you know the resistant paddy varieties? Yes/No
62. If yes, are you cultivating them?
    a) Hopper resistant variety ......
    b) Gall midge resistant variety ......
    c) Iron toxicity resistant variety ......
    d) Water logging resistant variety ......
    e) Other ......
63. Do you apply organic manure? Yes/No
64. If yes, how much do you apply per acre? ......
65. To what extent was your field affected by pests and diseases?
    a) Fully b) Half c) Few d) Not at all
66. Do you control pests and diseases by chemical application?
    Yes/No
67. If not, what are the problems?
    a) Lack of capital b) Not available at the correct time
    c) Poor extension service
    d) Following traditional methods
    e) None
68. If yes, what chemicals are used for pests \& diseases?

	Chemical	Problem	Dosage	Stage
a)	....	....	......	.....
b)	....	....	......	.....
c)	....	....	......	.....
d)	....	....	......	.....
e)	....	....	......	.....

69. How far do you have to go to buy these chemicals? ....
70. Can you buy them at retail price? Yes/No
71. How far is a motorable road from your residence? .....

84. What is the acceptable germination percentage?
0
1
85. What is the duration of soaking?
0
1
86. How many hours do you store the seed paddy?
0
1
87. What is the storage depth of seed paddy ?
0
1

Measure 3
=========

88. What is the spacing for transplanting, between rows?
0
1
89. What is the spacing for transplanting, within rows?
0
1
90. What is the spacing for row seeding?
0
1
91. Do you know the dapog nursery?
0
1
92. What is the seed rate for dapog nursery? (bu/ac)
0
1
93. What is the seed rate for broadcasting? (bu/ac)
0
1
94. What is the nursery area required to transplant one acre?
0
1
95. What is the rate of seedling per hill in transplanting?
0
1

Measure 4
=========

96. What is the type of fertilizer used as the basal dressing?
0
1

97. What is the quantity per acre?
0
1

98. When do you apply?
0
1

Measure 5
=========

99. What is the type of fertilizer used as the 1st top dressing?
0
1

100. What is the quantity per acre?
0
1

101. When do you apply it?
0
1

Measure 6
=========

102. What is the fertilizer used as the 2nd top dressing?
0
1

103. What is the quantity per acre?
0
1

104. When do you apply?
0
1

Measure 7
=========

105. Can you identify the stem borer attack?
0
1

106. Can you identify the brown plant hopper attack?
0
1
107. Can you identify the gall midge attack?
0
1
108. Can you identify the mole cricket attack?
0
1

Measure 8
=========

109. Can you identify rice blast?
0
1
110. Can you identify brown spot disease?
0
1
111. Can you identify iron toxicity?
0
1
112. What is the treatment given for iron toxicity?
0
1

Measure 9
=========

113. When do you do the 1st weeding?
0
1
114. What is the mechanical method of weeding?
0
1
115. Do you know the chemicals to control weeds? Yes/No
116. If yes, the chemicals used for broad leaved weeds?
0
1
117. The chemicals used for narrow leaved weeds?
0
1

118. Do you know any preventive methods when applying weedicides?

0

1

Measure 10

==========

119. What is the capacity of the knapsack hand sprayer?

0

1

120. Do you know the weight of the urea bag?

0

1

121. How many kilo grams go in one bushel?

0

1

122. How do you measure one fluid oz.?

0

1

123. How do you measure the percentage of pest damage?

0

1

IV. Indicators for Adoption Index

124. Do you use high yielding paddy varieties? Yes/No
125. If yes, from when? ....
126. Do you use dapog nursery? Yes/No
127. If yes, from when? ....
128. Do you practise chemical or mechanical weed control? Yes/No
129. If yes, from when? ....
130. Do you use chemical fertilizers? Yes/No
131. If yes, from when? ....
132. Do you use chemicals for pests and diseases control? Yes/No
133. If yes, from when? ....
134. Do you use a thresher? Yes/No
135. If yes, from when? ....
136. Do you clean stubble after the season? Yes/No
137. If yes, from when? ....
138. Do you transplant your paddy field? Yes/No
139. If yes, from when? ....

Thank you

Date: ....

Appendix 4

AGRICULTURAL EXTENSION AND RICE SMALL FARMERS

Questionnaire for Village Extension Workers (KVSs)

No: ....
AI Range: ....
KVS Range:.........

I. General Information

1. What is your name? ....
2. How old are you? ......
3. Sex? M/F
4. Civil status? S/M/D/W
5. When did you enter into this field? ....

II. Questions on Farmers

6. How many contact farmers are assigned to you? .....
7. How many farm families are assigned to you? .....
8. How many full time farmers do you have to serve? .....
9. How many part time farmers do you have to serve? .....
10. What is the extent of paddy area you have to serve? .....
11. What is the total extent you have to serve? .....

III. Questions on Visits

12. How many farmer visit days/week do you have? .....
13. How many CFs you are asked to meet/day? .....
14. How many CFs you are able to meet/day? .....
15. How many other farmers you are able to meet/day? .....
16. Do the CFs follow the visit schedule? .....
17. Do the CFs bring their problems to you? .....

IV. Questions on Training

18. When did you complete your training? ....

19. Where did you do your pre-service training? ....
20. Duration of this training? ....
21. What is the diploma or certificate you have received?
....
22. What is the number of years of field experience? ....
23. How many days/month do you participate in the training classes at the District Training Center? (bi-weekly training) ....
24. What is the form of training?
    a) Lectures b) Demonstrations
    c) Discussions d) Field work
25. Who conduct these training? ....
26. How many pre-seasonal training sessions have you participated in the last year? ....
27. How many pre-seasonal meetings do you conduct per year?
....
28. What are the general problems in attending training classes? (bi-weekly training)
    a) Transportation problems b) Time problems
    c) Duration is too much d) Too much contents
    e) Place is difficult to reach
29. How useful are these training for your work?
    a) Very useful b) Less useful
    c) Remained the same
30. Appropriateness of the training to solve the day to day problems
    a) Very appropriate b) Less appropriate
    c) Not appropriate
31. Is the training useful to upgrade your knowledge? Yes/No

V. Questions on Messages

32. Are you able to keep the contents of the messages given at the training classes?
    a) Fully b) Half c) Difficult
33. To what extent do you convey the message contents to CFs?
    a) Fully b) Half c) Little d) Not at all
34. Can they keep the message content to pass it to FFs?
    a) Fully b) Half c) Little d) Not at all

35. What are the methods of conveying messages to the farmers?
    a) By meeting the farmers individually
    b) By meeting the farmers as a group
36. What are the types of messages you receive to solve farmers problems?
    a) Messages on farming problems
    b) Messages on new techniques
    c) Messages on improving the farming practices
37. What are the problems you face in conveying messages to the farmers? ....
38. Do you convey messages to CFs? Yes/No
39. Do you convey messages to FFs? Yes/No
40. Can the farmers get the messages properly and pass them to the other farmers?
    a) Fully b)Half c) Little d) Not at all
41. Are you able to co-operate with the bi-weekly programmes? .....
42. The general extension work today is?
    a) More satisfactory b) Less satisfactory
    c) Remained the same

VI. Recommendations

Measure 1
=========

43. Do you know the recommended paddy variety for the area?
    0
    1
44. What is the duration of this variety?
    0
    1
45. What are the special characteristics of this variety?
    0
    1

Measure 2
=========

46. Do you know the method of removing weed seeds?
    0
    1

47. Do you know the salt treatment?
0
1
48. Do you know the germination test?
0
1
49. What is the acceptable germination percentage?
0
1
50. What is the duration of soaking?
0
1
51. How many hours do you store the seed paddy?
0
1
52. What is the storage depth of seed paddy?
0
1

Measure 3
=========

53. What is the spacing for transplanting, between rows?
0
1
54. What is the spacing for transplanting, within rows?
0
1
55. What is the spacing for row seeding?
0
1
56. Do you know the dapog nursery?
0
1
57. What is the seed rate for dapog nursery? (bu/ac)
0
1
58. What is the seed rate for broadcasting? (bu/ac)
0
1
59. What is the nursery area required to transplant 1 ac?
0
1

60. What is the rate of seedling per hill in transplanting?
0
1

Measure 4
=========

61. What is the type of fertilizer used as the basal dressing?
0
1
62. What is the quantity per acre?
0
1
63. When do you apply?
0
1

Measure 5
=========

64. What is the type of fertilizer used as the 1st top dressing?
0
1
65. What is the quantity per acre?
0
1
66. When do you apply?
0
1

Measure 6
=========

67. What is the type of fertilizer used as the 2nd top dressing?
0
1
68. What is the quantity per acre?
0
1
69. When do you apply?
0
1

Measure 7
=========

70. Can you identify the stem borer attack?
0
1
71. Can you identify the brown plant hopper attack?
0
1
72. Can you identify the gall midge attack?
0
1
73. Can you identify the mole cricket attack?
0
1

Measure 8
=========

74. Can you identify the rice blast?
0
1
75. Can you identify the brown spot disease?
0
1
76. Can you identify iron toxicity?
0
1
77. What is the treatment given for iron toxicity?
0
1

Measure 9
=========

78. When do you do the 1st weeding?
0
1
79. What is the mechanical method of weeding?
0
1
80. What chemicals are used for broad leaved weeds?
0
1

81. What chemicals are used for narrow leaved weeds?

    0

    1

82. Do you know any preventive methods, when applying weedicides?

    0

    1

Measure 10
==========

83. What is the capacity of the knapsack hand sprayer?

    0

    1

84. Do you know the weight of a urea bag?

    0

    1

85. How many kilo grams go in one bushel?

    0

    1

86. How do you measure one fluid oz.?

    0

    1

87. How do you measure the percentage of pest damage?

    0

    1

Thank you

Date:........

Appendix 5

Association of knowledge levels and farmer's age

Count Row % Column %	Age 20 - 40	 41 - 60	 61 ++	Total
Knowledge level				
Low (0 - 13)	8 42% 33%	5 26% 13%	6 32% 17%	19 100% 19%
Medium (14 - 18)	10 17% 42%	25 42% 63%	25 42% 69%	60 100% 60%
High (19 - 22)	6 29% 25%	10 48% 25%	5 24% 14%	21 100% 21%
Total	24	40	36	100

Statistic	Value	Significance
Kendall's Tau (B)	0.00298	0.4869

Appendix 6

Association of knowledge levels and formal education

Count / Row % / Column %	Education (Grade) 0 - 5	6 - 10	11 ++	Total
Knowledge level				
Low (0 - 13)	8	9	2	19
	42%	47%	11%	100%
	19%	19%	20%	19%
Medium (14 - 18)	29	27	4	60
	48%	45%	7%	100%
	67%	57%	40%	60%
High (19 - 22)	6	11	4	21
	29%	52%	19%	100%
	14%	23%	40%	21%
Total	43	47	10	100

Statistic	Value	Significance
Kendall's Tau (B)	0.10212	0.1354

Appendix 7

Association of knowledge levels and source of extension contact

Count Row % Column %		Type of extension contact					Total
		No	AIs	KVSs	COs	CFs	
Knowledge level							
Low	(0 - 13)	3	1	12	3	0	19
		16%	5%	63%	16%	0%	100%
		33%	14%	19%	16%	0%	19%
Medium	(14 - 18)	6	4	35	14	1	60
		10%	7%	58%	23%	2%	100%
		67%	57%	55%	74%	100%	60%
High	(19 - 22)	0	2	17	2	0	21
		0%	10%	81%	10%	0%	100%
		0%	29%	27%	11%	0%	21%
Total		9	7	64	19	1	100

Statistic	Value	Significance
Kendall's Tau (C)	0.02220	0.3840

Appendix 8

Association of knowledge levels and frequency of KVSs's visits

Count Row % Column %	KVSs' visits frequency					Total
	No visits	Once in 3 months	Once in 2 months	Once a month	Once in 2 weeks	
Knowledge level						
Low (0 - 13)	4	6	6	0	3	19
	21%	32%	32%	0%	16%	100%
	20%	38%	29%	0%	18%	19%
Medium (14 - 18)	13	6	14	17	10	60
	22%	10%	23%	28%	17%	100%
	65%	38%	67%	65%	59%	60%
High (19 - 22)	3	4	1	9	4	21
	14%	19%	5%	43%	19%	100%
	15%	25%	5%	35%	24%	21%
Total	20	16	21	26	17	100

Statistic	Value	Significance
Kendall's Tau (C)	0.15690	0.0343

Appendix 9

Association of knowledge levels and field trials

Count / Row % / Column %	Field trials: No	Field trials: Yes	Total
Knowledge level			
Low (0 - 13)	3	16	19
	16%	84%	100%
	13%	21%	19%
Medium (14 - 18)	11	49	60
	18%	82%	100%
	48%	64%	60%
High (19 - 22)	9	12	21
	43%	57%	100%
	39%	16%	21%
Total	23	77	100

Statistic	Value	Significance
Kendall's Tau (C)	0.17840	0.0186

Appendix 10

Association of knowledge levels and innovativeness

Count Row % Column %	Knowledge level Low (0 - 13)	 Medium (14 - 18)	 High (19 - 22)	Total
Adopter category				
Innovators	7	13	6	26
	27%	50%	23%	100%
	37%	22%	29%	26%
Middle adopters	10	38	12	60
	17%	63%	20%	100%
	53%	63%	57%	60%
Late adopters	2	9	3	14
	14%	64%	21%	100%
	11%	15%	14%	14%
Total	19	60	21	100

Statistic	Value	Significance
Kendall's Tau (B)	0.05213	0.2860

CONVERSION TABLE

1 Acre	0.4047 hectare (ha)
1 Square mile	2.590 square kilometers (sq.km)
1 Pound	0.4536 kilograms (kg)
1 Bushel of Paddy (46 pounds)	20.87 kilograms
1 Bushel/Acre	51.57 kg/ha
1 Rs (Sri Lankan)	0.033 US $

Statements

(a) Farmers are engaged in research. Hence, indigenous knowledge is an important element in the technology development.
(Source: this dissertation, p 122)

(b) Knowledge storage and retrieval by village extension workers are two important processes which are seriously neglected in the T&V system.
(Source: this dissertation, p 116-117)

(c) An index measuring the adoption of innovations by local farmers can be used as a tool for segmenting them into homogenous categories for purposes of technology development and extension. However, separate indices are necessary for different agro-ecological zones.
(Source: this dissertation, p 171-172)

(d) Field extension workers can have a considerable influence on the choice of recommendations that are appropriate to the conditions of the clients. Therefore, lower level extension workers should be given more power to decide on the extension offering.
(Source: this dissertation, p 94)

(e) The degree of similarity of the educational status of the officers concerned, is one of the essential variables governing research-extension linkages.
(Source: Seegers and Blok, 1988)

(f) Follower farmers have acquired the same knowledge on extension recommendations as the contact farmers.
(Source: this dissertation, p 193)

(g) Vocational education in agriculture at the secondary school level helps to meet the skilled manpower requirement.

Statements

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Mahinda Wijeratne,
Wageningen,
1st June 1988.

(h) The subject streams of the Sri Lankan school curriculum are much oriented towards university entry and have paid little attention to entry into technical fields.

(i) Scientists feel that they have 'no time' to lose as their career advancement normally depends upon the number of publications and citations.

(j) Once you study, you forget; once you study more, you forget more, then **why** study?

Mahinda Wijeratne

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