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**Part II – DIFFUSION AND ASSIMILATION OF S&T KNOWHOW
IN THE AGRICULTURAL SECTOR OF SRI LANKA**

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FOREWORD

The report on Diffusion and Assimilation of Scientific and Technical Knowhow in the Agricultural Sector of Sri Lanka constitutes the second phase of the study on Science and Technology Indicators of Sri Lanka.

In this study qualitative measures are evolved through a sample survey and case studies, to evaluate the impact of several information and technology transfer mechanisms currently in operation.

It is hoped that the findings of this study would be of benefit to the institutions, departments and ministries concerned with increasing agricultural productivity through the adoption of new and upgraded technology, to streamline the respective information transfer mechanisms.

The project received partial financial assistance from the Commonwealth Science Council (CSC), and hence its outcome also constitutes a component of Sri Lanka's contribution to the Science Management and Organization Programme of the CSC.

R.P. Jayewardene

A B B R E V I A T I O N S

AMDP	—	Accelerated Mahaweli Development Programme
ASCA	—	Agrarian Service Committee Area
BM	—	Block Manager (Mahaweli)
CECB	—	Central Engineering Consultancy Bureau
CCB	—	Coconut Cultivation Board
CRI	—	Coconut Research Institute
DRPM	—	Deputy Resident Project Manager (Mahaweli)
EIED	—	Employment, Investment and Enterprise Division (Mahaweli)
EO	—	Extension Officer (at the level of an Agricultural Instructor, Rubber Instructor, Coconut Development Officer, etc.)
FA	—	Field Assistant
KVSN	—	Krushikarma Viapthi Sevaka Niladari (Village level extension officer)
MASL	—	Mahaweli Authority of Sri Lanka
MEA	—	Mahaweli Economic Agency
MECA	—	Mahaweli Engineering and Consultancy Agency
MDB	—	Mahaweli Development Board
R & D	—	Research and Development
RPM	—	Resident Project Manager (Mahaweli)
RRI	—	Rubber Research Institute (of Sri Lanka)
RTWG	—	Regional Technical Working Group (Department of Agriculture)
RVDB	—	River Valleys Development Board
S & T	—	Science and Technology
SMO	—	Subject Matter Officer
T & V	—	Training and Visit System
TRI	—	Tea Research Institute (of Sri Lanka)
TSHDA	—	Tea Small Holdings Development Authority
UM	—	Unit Manager (Mahaweli)
VCR	—	Value to Cost Ratio
VP	—	Vegetatively Propogated Clones

Chapter 1

I N T R O D U C T I O N

1.1 BACKGROUND

Science and Technology (S & T) has many diverse components of which Research and Development (R & D) constitutes the most significant activity. Research and Development can be looked upon as a system comprising of several levels of activities, for which terms such as fundamental, basic, applied and experimental development research are used. These are generally well recognised stages of scientific work although it is usually not easy to identify where one phase ends and another phase begins. Nevertheless all of these stages can get linked up in a chain of activities catalysed by the demands of intermediary or end users, leading to an output which may provisionally be described as new knowledge. This new knowledge is embodied in new techniques, technologies, processes, inventions, innovations, refinements, products, skills and also in trained manpower.

One of the major concerns in Science and Technology is the transfer and utilization of new knowledge generated in R & D. Firstly, the new knowledge so generated has to be of such refined quality that it could be used directly. Secondly, the new knowledge should have a proven and demonstrable advantage over what is currently existing or known. Thirdly, new knowledge should be self-contained and total in the ramifications of its applications, and fourthly, new knowledge should be compounded and packaged in an assimilable form for direct use.

Although research scientists hold the key to the first three requirements, the fourth requirement needs to be mainly handled by extension or information specialists, whose skill in formulating the package will now be a factor of significance in the dissemination phase of information.

Information dissemination and diffusion of knowhow to end users, and its final utilization are the issues of the present study. Transfer of knowhow is indeed one of the critical gaps in the S & T systems of developing countries. There are several reasons for this unfortunate situation, of which the following are the most common.

- (a) Mismatch of demand with supply in relation to the needs and aspirations of the people.
- (b) Lack of a planning process for science and technology in development planning, with the result that many science programmes run totally independent of development programmes.

- (c) Inadequacy or the weakness of the linkages between researchers, extension workers and end users.
- (d) Feeble demand for innovations in many fields due to the small and unsustainable internal market.
- (e) Poorly, managed extension services, with a hierarchical administrative structure, lacking flexibility and capacity to absorb changes in advance.
- (f) Inappropriate and unintelligible information packages.
- (g) Time lag and inordinate delays in information transfer, making such information no longer useful.
- (h) Economic and socio-cultural constraints.

Information dissemination is a vital process in the S & T system of a country, because not only does it make R & D meaningful, and justify the massive financial and manpower outlay on it, but also it sets in motion the cyclic process of socio-economic progress, national development and advancement in S & T.

It has to be noted however, that although there are several formal mechanisms for transfer of knowhow, in practice the transfer process depends only partially on these formal mechanisms. In some instances, non-formal linkages play a more important role in the dissemination of information.

Further it has to be realized that a complex balance exists between new discoveries, and acceptance of such discoveries by the community. Hence the selection and choice of knowhow from a given pool of knowledge in relation to economic and socio-cultural demands, and matching it with the literacy levels and environmental factors is a sensitive and difficult process. Nevertheless the challenge has to be accepted and the massive outlay on R & D and on extension services has to be justifiably utilized.

1.2 SCOPE OF STUDY

The present study attempts to identify the linkages in the delivery, transmission and diffusion processes of scientific and technological developments to the final users of this knowledge. The process as it is generally known, is not a direct transfer, because between the experimental field or the laboratory bench, and the end user is a wide gap, which is not readily bridged. In fact, in industrial technology, this gap represents the most formidable limiting factor in the delivery phase of new knowledge. In agricultural technology, although theoretically this interface does not represent a major hurdle, the delivery process is not direct, but takes place through several intermediaries. Hence so long as the intermediary conveyor system functions smoothly and efficiently the delivery of new knowledge will take place effectively. In practice however, this transfer chain does not operate as effectively as could be conceived, mainly due to dislocations at interfaces.

In this study, therefore a concerted effort is made to identify the various categories of intermediaries involved in information transfer, and the constraints in delivery at the respective interfaces in agricultural activities of Sri Lanka.

In attempting to evaluate these processes, the study will also focus its attention on the different types of transfer or extension systems employed in the country, the type and quality of knowhow that flows through various systems, and the technical contents of the messages transmitted. These aspects will be then evaluated through appropriate qualitative and quantitative measures for their effectiveness.

Due to logistic reasons and for a deeper investigation, the main study has been largely concentrated in the two agricultural ecosystems of Kamburupitiya (Matara) and Peradeniya. These two locations are also graced by the presence of two well known centres of higher education in agriculture (the agriculture faculties of the universities of Ruhuna and Peradeniya respectively). The other characteristic of these two zones includes the following.

- (a) Existence of multiple cropping systems under two different agroclimatic situations (i.e. low-country intermediate zone and mid-country wet zone).
- (b) Existence of small farming units with intensive agricultural practices.
- (c) Representation by several extension service organisations
- (d) Presence of several agricultural research units.

The study will be limited to crop husbandry, especially food crops, and hence exclude the sub sectors of livestock, fishery and forestry. However, the main study is complemented with two case studies; one concentrating on the extension framework in the Mahaweli systems, and the other focussing attention on an FAO — sponsored extension programme on fertilizer usage.

1.3 METHODOLOGY

In this study four questionnaires were used to extract the relevant information. The first questionnaire was addressed to heads of extension divisions of the agricultural sector. This questionnaire attempted to extract basic information on organizational features of the respective extension divisions, and the manner in which new knowledge is acquired and packaged. The issue of this questionnaire was followed by interviews and discussions with the sectional heads of the respective extension divisions, for clarification of various critical issues.

The second questionnaire was issued to extension officers attached to various extension systems. By this means, the mechanism of transfer of S & T knowledge, and their assessment of the effectiveness of the information being transferred through nearly 800 extension officers in the country was investigated.

The third questionnaire was addressed to users of knowledge in the two districts of Matara and Kandy, and was designed to understand the problems of receivers of new knowledge.

The fourth questionnaire was directed to the research staff of Faculties of Agriculture of the universities of Peradeniya and Matara. The purpose of this questionnaire was to find out the involvement of researchers in the process of dissemination of knowledge, from the institutes of higher education to the end-users. While chapter two of this report

presents the overall layout of the agricultural activities in the country and the structure of the agricultural extension services, chapters 3 and 4 analyses the various phases of extension activities for field crops. Chapter 5 reviews the corresponding activities in the new settlements of the Mahaweli Systems and Chapter 6 examines the outcome of an extension programme sponsored by FAO to promote yield increases through efficient use of fertilizer.

Chapter 2

STRUCTURE OF AGRICULTURAL EXTENSION SERVICES

2.1 OUTLOOK ON AGRICULTURE

Nearly 80 percent of the country's population live in rural areas, and about 54 percent of the rural population depend on agriculture.

Agriculture continues to be the mainstay of the country's economy, contributing about 28 percent to the Gross Domestic Product and accounting for 60 percent of the total export earnings during 1987. About 45 percent of the country's labour force is engaged in agricultural production, which had grown around 3.3 per cent per annum during the period 1978 to 1987, and expected to continue at a growth rate of 4 per cent during the period 1988—1992 (9).

It has been reported that out of 6.56 million hectares of available land, around 2.01 million hectares are cultivated with permanent and annual crops, constituting of 1.47 million hectares of small holdings and 0.54 million hectares of large holdings (8, 9), Table 2.1 summarizes the distribution of agricultural land on broad land-use classes.

However, over the past few years, the growth in agricultural output had been marginal except for paddy production, which had risen from 80 million bushels in 1977 to 127.5 million bushels in 1986, but dropped to 101.9 million bushels in 1987 (8, 9).

The Tables 2.2 to 2.4 summarizes some of the trends in the progress of agricultural development in Sri Lanka during the past two years. In respect of food and oil crops, (Table 2.2), it is clear that land area under cultivation shows considerable variation, and with the exception of sugar cane, the largest extents under cultivation for other crops were during the period 1982 to 1985. The situation appears to be the same with paddy (Table 2.3) with the total extent under cultivation being highest in 1984, and the yield per hectare being highest in 1983.

The general pattern in respect of these crops has been, that despite research and development work and access to extension services and improved input components, other adverse factors have curtailed agricultural production. The main causes for this trend has been the ethnic problem of the northern and eastern parts of the country and the adverse weather conditions in some of the major rice and food crops producing districts. However, the impact of extension services and subsidy schemes can be broadly judged from the trends in the use of new varieties of planting material and in the consumption of fertilizers and other agricultural inputs. Thus in the case of paddy, the area

TABLE 2.1**DISTRIBUTION OF AGRICULTURAL LANDS BY BROAD LAND — USE
CLASSES AND SMALL AND LARGE HOLDINGS IN HECTARES**

Crop	Small Holdings Sector	Estate Sector
1. Paddy and other temporary crops	738,725	13,121
2. Plantation crops (mainly tea, rubber and coconut)	415,758	382,334
3. Other permanent crops	143,916	32,589
4. Forest land	20,984	33,146
5. Pasture land	4,432	15,567
6. Cultivable land - not cultivated	68,934	22,719

Source: Agricultural Statistics, Volume V (1987)
Dept. of Rural Credit, Central Bank of Sri Lanka.

under improved varieties had shown a steady increase reaching a maximum in 1984, and although there is a decline thereafter, the significant feature is that by 1987 about 99.7 percent of the cultivated land was under improved varieties (9). Likewise, fertilizer usage had increased from about 85,000 tonnes in 1970 to 232,000 tonnes in 1986 and to 211,000 tonnes in 1987. The use of certified seeds increased from 100,000 bushels in 1977 to 334,000 bushels in 1984, but had shown a steep decline thereafter, due to the increased participation of the private sector(9).

The performance of plantation crops as shown in Table 2.4 is again variable, mainly caused by weather conditions, market forces, value to cost ratio etc.

TABLE 2.2

FOOD AND OIL SEED CROPS
Land Area under Cultivation (× 1000 ha)

Crop	1982	1983	1984	1985	1986	1987
Sugar	5.4	5.7	5.7	4.5	10.0	10.4
Maize	44.9	47.3	45.7	37.9	36.4	40.5
Kurakkan	20.4	11.3	16.0	10.9	11.9	10.7
Greengram	21.2	28.6	29.6	21.5	24.2	24.3
Blackgram	9.3	17.5	33.4	12.1	10.1	13.9
Cowpea	35.7	45.0	13.3	22.7	24.7	30.1
Sesame	32.7	31.6	5.0	14.1	11.5	16.1
Groundnuts	14.4	13.8	7.6	7.9	10.0	9.2
Soya bean	17.4	14.6	11.8	2.4	6.3	6.7
Chillies	28.4	32.1	30.8	32.1	36.5	26.2
Onions	8.2	11.7	8.3	5.9	8.7	10.8
Manioc	52.9	37.8	38.3	35.5	27.4	23.7
Sweet potatoes	9.1	7.9	9.6	8.8	6.2	—
Potatoes	5.7	6.6	7.9	8.4	7.9	6.4

Source: Ministry of Finance and Planning - Public Investment 1987 - 1991 and 1988 - 1992

TABLE 2.3

TRENDS IN CULTIVATED EXTENTS, PRODUCTION AND YIELD OF PADDY

	1970	1977	1980	1983	1984	1985	1986	1987
Total extent cultivated (× 1000 ha)	750	818	835	815	978	870	887	772
Area under improved varieties (× 1000 ha)	530	684	696	748	905	810	849	770
Average yield per hectare (bushels)	125.7	117.8	139.6	172.2	148.8	163.8	164.5	168.5
Total production (in million bushels)	77.3	80.3	102.1	118.7	115.9	127.5	124.3	101.9
Fertilizer usage (× 1000 t)	85	123	190	n.a.	187	202	232	211
Use of certified seed (× 1000 bushels)	n.a.	100	156	n.a.	334	225	198	126

Source: Ministry of Finance and Planning - Public Investment 1988 - 1992

TABLE 2.4
PERFORMANCE OF TREE CROPS IN TERMS OF USE OF FERTILIZERS AND PRODUCTION

	1970	1978	1980	1983	1984	1985	1986	1987
TEA								
Average yield per ha in kg	921	958	922	782	792	926	947	965
Total production (in mn. kg)	210	199	191.4	180	180.7	214	211.3	213.3
Fertilizer usage (× 1000 t) mt. tons	108.4	115.6	101.7	115.5	137.2	149.9	128.8	36.7
RUBBER								
Average yield per ha in kg	803.4	824.4	717.2	818	840	838	830	744
Total production (in mn. kg)	160	156	133	140	142.0	137.5	138.5	121.5
Fertilizer usage (× 1000 t)	—	21	21.4	18.6	23.5	24.2	26.3	24.7
COCONUT								
Average yield per ha (no. of nuts)	5,556	5,020	4,604	5,254	4,413	6,722	7,257	6,223
Total production (in mn. nuts)	2,445	2,209	2,026	2,312	1,942	2,958	3,041	2,292
Fertilizer usage (× 1000 t)	64.08	42.6	55.8	35.7	50.0	41	31.5	42.2

Source: Performance - Jan-March 1986, Ministry of Plan Implementation
National Agricultural Research Plan, Agric. Research Group, National Planning Division
Annual reports Central Bank: 1970 - 1983, 1978 - 1984, 1976 - 1985, 1980 - 1986
Public Investment - 1984 - 1988, National Planning Division
Census of Agriculture, Reports, Dept. of Census and Statistics
Sri Lanka Coconut Statistics - 1987 Published by Coconut Development Authority
Economics and Social Statistics of Sri Lanka, Statistics Department/Central Bank of Sri Lanka 1985.

While the total production of rubber indicates a steady decline from 160 million kg. in 1970 to 156 million kg in 1978 and to 121.5 million kg in 1987, Tea and Coconut production had dropped to lower levels around 1984 and picked up gradually during the later years. (9).

The trends in food production and agricultural productivity in relation to the general pattern for developing countries is illustrated in Table 2.5

TABLE 2.5

**FOOD PRODUCTION IN SRI LANKA IN COMPARISON TO THE
GENERAL TRENDS FOR DEVELOPING COUNTRIES**

Food Production (Rice)		
Sri Lanka (1982 - 1984)	Means for Developing Countries	
Cereal output 1.5 million tons	0.4 million tons	
Cereal area 0.8 million ha	0.5 million ha	
Cereal yield 3342 kg/ha	1300 kg/ha	
Meat output 30 (in 1000 tons)	60 (in 1000 tons)	
Milk yield 460 kg/head	685 kg/head	
Change in Food Production	1972/74 vs 1983/84	
	Sri Lanka % year	Means for Developing Countries
Change in cereal output	4.9	1.4
Change in cereal area	0.6	0.8
Change in cereal yield	4.3	0.9
Change in meat output	0.7	5.2
Agricultural Input 1983	Sri Lanka	Developing Countries
Economic lands in crop	44%	20%
Cropped land irrigated	25%	9%
Cropped land per 100 persons	10 ha	30 ha
Fertilizer use	74 kg/ha	26 kg/ha
Tractor	11.9 per 1000ha	3.4 per 1000 ha

Source : Winrock International (1987). Agricultural Development Indicators 4th ed. Winrock International Institute for Agricultural Development, Morrilton.

The data presented in Table 2.5 indicates that trends in food production, especially cereals, compare very favourably with other developing countries. The cereal output and yield per unit area has also recorded a substantial growth during the period 1972/74 to 1983/84. On the other hand, meat output and milk yields have been considerably lower than the average for developing countries. (12)

In relation to agricultural inputs, the use of tractors, fertilizers and irrigation facilities records more than a 3-fold increase over the average for developing countries. However, the extent of farming land available per person is on an average only about a third of the extent generally available per person in developing countries.

Although agricultural production and productivity patterns show a healthy trend in relation to other developing countries it has to be noted that further improvements are possible. For example while the world standard for the yield of sugar cane is around 6.2 to 7.4 tons per hectare the current average for Sri Lanka is around 4.0 to 4.5 tons per hectare (9). It is unfortunate that even in respect of our traditional commercial crops, yield trends have been considerably lower than those of our international competitors. Thus the current national average yields for tea are about 930 kilograms per hectare, whereas in South India the average yield is in the region of 1890 kilograms per hectare (9). In respect of rubber, the average yield for Sri Lanka is of the order of 840 kilograms per hectare, whereas in Malaysia the yields are over 1000 kilograms per hectare. For coconut, the current average is about 4900 nuts per hectare, when the potential for production is in the region of 7400 nuts per hectare. It is thus evident that further effort in terms of production subsidies and concerted extension services would be required to enhance productivity in these sub-sectors.

2.2 RESEARCH AND DEVELOPMENT

The Agricultural Research System of Sri Lanka has been discussed in several reports, including one by the International Service for National Agricultural Research (ISNAR) based in the Netherlands (5). While institutions such as the Department of Census and Statistics, The Central Bank and the Agrarian Research and Training Institute produces annually the relevant agricultural statistics, more recently Liyanage and De Silva (6), have compiled and reviewed statistical information on scientific research with reference to the agricultural sector. According to this study the research expenditure in the agriculture sector had increased from Rs. 128.8 million in 1983 to Rs. 152.6 million in 1984 at a growth rate of 15.6 per cent. However, in real terms (at constant 1975 prices), the R & D expenditure had increased from Rs. 45.7 million in 1983 to Rs. 46.3 million in 1984, indicating a growth rate of only 1.3%. Although the Agriculture, Forestry and Fisheries sector accounts for nearly 60 percent of the total R & D investment in the country, agricultural sciences have attracted only 20 percent of the total scientific and technical workforce. This deficiency, especially of post graduate qualified research personnel in agricultural Sciences has been highlighted in the draft National Agricultural Research Plan produced by the Agricultural Research Group of the National Planning Division, Ministry of Finance and Planning (7).

It has been found that 96 percent of funds spent on Agricultural Research in the country has been accounted for by the following organizations (6):—

1. Department of Agriculture
2. Agrarian Research and Training Institute
3. Minor Export Crops Department
4. Sugarcane Research Institute
5. Coconut Research Institute
6. Tea Research Institute
7. Rubber Research Institute
8. Veterinary Research Institute

9. National Aquatic Resources Agency
10. Fisheries Ministry
11. Forest Department

Hence it has to be assumed that the direction and strategies of Agricultural Research in the country are implicit in the policies and programmes of these organizations. These institutions have consumed nearly Rs. 41 million (about 28 percent) as capital expenditure, as against about Rs. 106 million on recurrent expenditure. The average research expenditure per research scientist in these institutions was Rs. 184,000 in 1984. However, when estimated in terms of postgraduate researchers, the perhead expenditure increases to Rs. 654,000, which is infact a reflection of the shortage of postgraduate trained reseachers rather than to the larger availability of resources. Only 8 percent of the research expenditure in the agricultural sector was directed towards the sub sectors of fishery and forestry. The sub-sectoral R & D expenditure as a percentage of GNP of the agriculture sector, varies from 1.9 percent for coconut to just 0.11 percent for forestry (6).

2.3 THE SCOPE OF AGRICULTURAL EXTENSION SERVICES

2.3.1. Objectives and Modalities

The main objectives of the agricultural extension institutions is to sensitize the farming community to use scientific know-how, methodology and materials of enhancing agricultural productivity. These institutions are also involved in the training of extension personnel, dissemination of information and materials, and assisting farmers in obtaining credit and subsidies for agricultural inputs. A well organized extension service can thus function as a major vehicle for initiating a change in the agricultural production system.

Several modalities are available for transmission of knowledge, among which the following are the most common.

- (a) Direct personal contacts with farmers, through visits and training programmes.
- (b) Organisation of information transfer activities such as seminars, workshops, field days, exhibitions, demonstrations, film shows, radio and television programmes, group discussions, poster displays, competitions and distribution of advisory leaflets.
- (c) Indirect influence through distribution of subsidies, procuring of necessary inputs, arranging agricultural credit and crop insurance, providing pest control services etc.
- (d) Indirect contacts through "contact" farmers, youth leaders, rural development societies and village level agricultural committees.

2.3.2. Factors Affecting Dissemination of Information.

Many factors are known to affect the conveyance of information. First and foremost is

the realization and understanding of the content of technological information to be transferred. This would mean that new scientific information needs to be adequately processed and packaged so as to be comprehensible by both the extension service personnel as well as the ultimate user - the farmer.

In a bureaucratic hierarchical set up, the step-wise transfer needs careful processing at all levels, to avoid distortions or dilutions at the end of the delivery system, since language and cultural barriers, levels of education (comprehension), and personal bias at the different inter-phases of the hierarchical flow-chart can dislocate the information transfer chain.

The second aspect involves methods of information transfer; some of which are crop-specific, while others are of general application. It is true that while some methods are more suitable for one type of agricultural system, or a particular class of farming communities, others are effective in a general way. Hence it is common to use a combination of methods in order to serve the needs of a multitude of situations.

The third aspect is the vital relationship between the producer and user of new innovations and knowledge, which is substantially weak in the agricultural research system. The third party information transfer mode permits only the delivery of abstract formula-type pelleted information, without an appreciation of the philosophy or principle involved. Such a stereotype information module can frequently lead to an ineffective or less efficient application of new knowledge and innovations. A simple illustration could explain this phenomenon. It is common in rural homesteads to apply kitchen ash as a fertilizer in home garden plots. Kitchen ash, which is often rich in potassium, and has less of other basic plant nutrients, when applied regularly to perennials, like coconut, tends to induce a nutrient imbalance, leading to acute deficiencies of essential minerals. The most common disorder is the deficiency of magnesium. Magnesium deficiency is easily identifiable by the characteristic foliar discolourations, and the curative treatment as specified in any standard literature is the application of a soluble magnesium fertilizer to enhance the supply level. However, a simple understanding of the principles, would show that a partial or temporary withdrawal of kitchen ash rather than the costly exercise of applying a special inorganic supplement, would cure the disorder.

2.3.3. Factors Influencing Technology Utilisation

As much as the conveyance of information is governed by several independent and dependent causes, the absorption, assimilation and utilization of new knowledge is also influenced by many factors. With an extraordinarily high literacy level, the Sri Lanka farming community is not likely to be limited by a low capacity for absorption of new knowledge. The fact that the traditional farming systems adopted by the rural farmers are rich in scientific and technological features is a tribute to their ingenuity and intelligence.

Nevertheless other external factors tend to dissuade farmers from accepting a change, however convincing and promising it may appear. One of the dominating issues is the value to cost ratio (V.C.R.), which provides a quantitative index of the cost effectiveness or the profit margin per unit of the produce. It is argued that any new technical information which can increase the V.C.R. of a crop has a good chance of being adopted and utilized immediately. Many of the food crops and paddy have a V.C.R. ranging from 4 - 6, while coconut has a V.C.R. of about 2. When the V.C.R. is high, there is also no reluctance among farmers to provide the required inputs to increase productivity, but

when the V.C.R. is low, farmers are hesitant to provide the inputs, especially the fertilizers, resulting in progressive decline in yields. Apart from weather factors, the fluctuating fortunes in productivity and profit in the coconut industry are related to the V.C.R. - induced pattern of fertilizer application.

A third issue which can affect absorption of new information are the past records of failures and successes. Although sometimes due to unforeseen reasons, new interventions fail as a result of the malfunctioning of one component, or due to a secondary disorder, such failures cultivate distrust among potential users. Thus for example, it has been stated that the recent outbreak of *Corynespora* disease in the so called high-yielding, disease-resistant clones of rubber, will henceforth demand greater effort to convince the farmers to accept new clones developed by the R.R.I.

On the encouraging side however, are the state-sponsored production incentive schemes, to induce growers to accept improved planting materials, to use fertilizers and other inputs as required, and also to utilize better and scientific management techniques.

These incentives include a package of subsidies for planting, rehabilitation, crop-diversification and management, backed in the case of certain crops like sugar with a pricing policy, in tea, a reduction of export duty, the abolition of export duty on tea bags, and an increase in the threshold price at which the *Ad valorem* sales tax is levied.

In addition to the above currently operating Medium Term Investment Programme for the state-owned plantations, and the proposed Investment Programme for the private sector-small-holdings for field and factory development of tree crops, are strategies and plans projected to enhance productivity.

It is also to be noted that the National Agriculture, Food and Nutrition Strategy, which constitutes the major investment plan in the agriculture sector, is currently reviewing the agricultural extension system in the country, with a view to developing a project to improve the capability and effectiveness of the extension service, and strengthening of ties between extension and research (9).

2.4 THE ORGANIZATIONAL STRUCTURE OF AGRICULTURAL EXTENSION SERVICES

S & T extension activities in the country are largely handled by the public sector institutions. These institutions are responsible for servicing specific commodities or disciplines and are specialized in the production, processing and handling of these commodities. The extension service of the agricultural sector is structured to meet the needs of several crops, but with the emphasis being on rice. The following agricultural extension service organizations are involved in the agriculture extension work.

- (a) Extension Services Division of the Department of Agriculture.
- (b) Department of Minor Export Crops.
- (c) Animal Health & Extension Division of the Animal Production and Health Department.
- (d) The Coconut Cultivation Board.
- (e) Advisory Services Department of the Rubber Research Board.
- (f) The Extension Division of the Tea Research Institute.
- (g) Tea Small Holdings Development Authority.
- (h) Fisheries Ministry.

The formal mechanisms available for dissemination of knowledge in agricultural research, constitutes the major components in the so-called "Related S & T Activities" of the Sector. Among the rural communities, the effectiveness of various mechanisms of knowledge transfer become evident only as far as the perceived needs of the user, his receptiveness for a change, and his ability to implement new ideas within a given economic framework, becomes a reality.

The Agriculture Extension Workers are the primary source of information for farmers in the rural farming systems of the country. Infact it has been reported that the other mechanisms for transfer of knowledge such as radio, newspapers, journals, field days, and other advisory literature, appear to have only a marginal impact on agricultural development (11). As pointed out earlier, several organizations in the public sector are responsible for the generation of innovations and the transmission of S & T information to the farmers. However, the horizontal interaction of these organizations seems to be rather poor with the extension functions in some instances, overlapping or replicating, and in some cases even contradicting.

The approach used in agriculture extension services differ significantly from the industrial extension activities, since agricultural activities demand a high degree of co-ordination and co-operation of activities among farmers. For example, the application of pesticides and weedicides and the requirement of irrigation waters demand a co-ordinated approach among farmers in dense small-holding farms. Further the multiplicity of cropping systems, the diversity of crops cultivated, the range of land holding sizes and the heterogeneity of the social class structure, demands an integrated service in which not only research and extension service organizations would be involved, but also financial institutions, insurance companies, agro-chemical dealers and also co-operative societies.

2.4.1. Extension Service Activities of the Department of Agriculture

The extension services of the Agriculture Department cover several crops and provide an almost a country-wide service to a large number of farming units. The most widely cultivated crop in Sri Lanka is paddy with about 29% of the agricultural land under this crop. The extent of land under coconut was in the region of 18.7%, tea constituted about 10.1%, rubber about 8.5%, horticultural crops about 24.2%, field crops about 7.2% and other tree crops about 2.3% (1). The extension services provided by the Department of Agriculture cover cereals, food crops, some oil bearing crops and horticultural crops.

The public spending on the production and dissemination of agricultural knowhow and technology was estimated around Rs. 112 million for 1984, out of which the research and development component was estimated to be around Rs. 50 million.

The annual budget of the Department of Agriculture was Rs. 260.7 million in 1987, of which nearly 70% was channelled to agricultural extension, crop production, and training and education activities. Therefore the extension and educational services are important functions of the department, and these activities together with the R & D work of the department has been projected to produce a high rate of return on this investment. Thus it is projected that paddy production will grow at an annual rate of about 4 per cent to reach a level of 140 million bushels by 1992, if weather conditions remain favourable (9).

The functions of the extension division of the Agriculture Department are organized at different levels to meet the needs at national, regional, district, segment, divisional and village levels.

The extension activities are monitored by a Deputy Director who is in charge of the administration of the 25 extension service districts. The coverage of these districts range from about 1217 sq. kilometers to 7224 sq. kilometers. The Deputy Director is assisted by four Additional Deputy Directors, who are in charge of regions which consist of 7 - 10 administrative districts. The Deputy Directors are assisted by 39 Assistant Directors of Agriculture. They are in charge of district agriculture extension programmes. Under the Assistant Directors nearly 250 subject matter specialists and 100 agricultural officers are employed for guiding, directing and monitoring the extension programme according to the needs of different districts and crops. The subject matter specialists are the vital link between Research and Extension. They provide the technical back up to the extension staff.

Each district is subdivided into several segments and each segment is under an agricultural officer. The agricultural officer is responsible for implementing technical programmes. Generally, the agricultural officers possess a degree level or Diploma level educational background in agricultural sciences. Some agricultural officers who are promoted through the departmental examinations, have acquired several years of field experience.

Each segment of agricultural extension is also supported by a team of Subject Matter Officers (S.M.O.), whose function is to service a particular crop or a discipline. They are also responsible for training the field level extension workers. Each segment is further subdivided to divisions and these divisions are referred to as the Agrarian Service Committee Areas (ASCA).

There are 519 such committees throughout the Island. Each ASCA is serviced by an Agricultural Instructor. The Agricultural Instructors are usually diploma holders of the School of Agriculture. Each Agricultural Instructor is assisted by 3 to 5 village extension workers who are also known as Krushikarama Viyapthi Sevaka Niladari (K.V.S.N.). There are about 2312 KVSNS, who are recruited with a farm school diploma or the senior School Certificate as basic qualification.

Each KVSNS has to serve about 1000 farming families and this number has steadily increased to well over 1500 due to a shortage of staff and increase in farms units. The KVSNS's maintain direct contacts with farmers.

The Training and Visit system (T & V) has been adopted by the Dept. of Agriculture since the year 1980, as the mechanism for extension activities. In this system, specially selected contact farmers operate as the transferers of knowledge. The T & V system was originally implemented in Turkey in 1980's, and it was subsequently introduced to many developing countries.

This system is intended to focus the extension efforts on target groups of farmers so that there will be less intermediary extension personnel, and more efficient transfer of information. The village level extension workers communicate directly with farmers, covering usually about 700 - 800 farming families. The farmer families are constituted into eight groups, and in each group about 10% are chosen as "contact farmers". The KVSNS's are expected to visit each of the eight farmer-groups, once in two weeks, on a pre-determined day. The T & V system aims at focussing attention on main crops grown in the area, and on the most important farming methods. The success of the system depends on the initiatives of contact farmers, and there are several constraints in communication among farmers some of which are due to various social factors.

Since the Department of Agriculture is involved in the dissemination of information of a wide range of crops throughout the Island, its institutional structure has to be extensive and broad-based to cover all these crops.

The main thrust of extension services of the Agriculture Department can be listed as follows:—

- (a) Transfer of technology to farmers to increase production of annual crops and oil seed crops.
- (b) Promote cultivation, and encourage minor export crop cultivation in coconut small holdings.
- (c) Collection of statistics of food crops.
- (d) Training of family units to improve standards of living in rural families.
- (e) Development of programmes for young farmers clubs.
- (f) Feeding information from farmers to researchers.
- (g) Conduct on the farm field trials.
- (h) Distribution, of certified and requested seed material to farmers.
- (i) Implementation of the subsidy scheme at field level.

Generally the extension activities of the Agriculture Department have a strong emphasis on rice. The major elements of the extension programme include increasing the acreage under high yielding varieties, integrated pest management, and the introduction of improved and low cost management techniques. The method of extension activities has been constantly reviewed by the department. The problems of staff recruitment and training has been a major constraint.

2.4.2. Livestock Extension

In the livestock sub-sector two national organizations assist in the development of livestock and dairy products. These are the Department of Animal Production and Health and the National Livestock Development Board. Both these organizations come under the Ministry of Rural Industrial Development and caters to about 600,000 livestock farmers in the country.

The extension arm of the Department of Animal Production and Health is the Animal Health and Extension Division. Its extension staff at field level number 1335, distributed around 24 districts of the Island. The expenditure on extension service activities increased from Rs. 1.3 million in 1985 to 2.2 million in 1986.

Research expenditure in livestock amounts to Rs. 5.7 million which is about two fold the expenditure on extension services. The extension workers are involved in advisory visits, group discussions, demonstrations, field days and audio visual programmes. Their major tasks involves distribution of seed material, subsidy inspections, vaccinations and artificial insemination work. The extension activities are under the Deputy Director of Animal Health & Extension, who is assisted by seven assistant directors incharge of different regions. There are 126 veterinary units in the country, each manned by a veterinarian. There were 145 livestock development officers and 450 livestock development technicians in 1987.

The major thrust of the extension programme of the National Livestock Development Board has been the establishment of good varieties of grass & fodder, upgrading of livestock mainly chicks and broilers, health care scheme for calf, and the improvement in management techniques of livestock development. The major constraint of livestock extension has been the shortage of transport, inadequate supply of equipment, and lack of incentives for staff. It has been reported that there is no serious problem in the recruitment of staff for livestock extension activities, however, the additional functions in curative and administrative work, has been a major hurdle in conducting extension work. The service of one livestock development officer is available for each veterinary unit. The livestock development extension workers are associated with field operations mainly in the respective agriculture service centre areas.

The major functions of livestock extension include the following:—

- (a) Control of major contagious diseases.
- (b) Breeding through artificial insemination, vaccinations, stud services, castration of animals of poor genetic value.
- (c) Extension and training through rural veterinary centres, field visits, village level organizations and direct contacts with local farmers.
- (d) Subsidy distribution, issue of breeding stock and pasture cultivation, supply of inputs and advice.

These officers are responsible for all information requirements of the farmers in pasture development, education, training and marketing of produce.

2.4.3. Extension Service for Plantation Crops

The plantation crops Tea, Rubber and Coconut have well established research and extension services. The extension services are primarily concerned with the production and improvement of specific crops and their products. The extension services in the plantation sector are generally well integrated with the activities of the respective research institutions, with the latter often undertaking training of extension officers and instructing them on the need for application of new methods. It is generally observed that the established plantations seldom encounter serious problems, except for example, the outbreak of *Promecotheca cumingi* in the coconut industry and the more recent fungal infection of *Corynespora* in the rubber industry. Hence the extension service activities generally can be well co-ordinated and operated smoothly.

The expenditure incurred in the extension activities of the three major plantation crops are given in Table 2.6.

TABLE 2.6**RECURRENT AND CAPITAL EXPENDITURE ON EXTENSION ACTIVITIES FOR COCONUT, RUBBER & TEA FOR THE PERIOD 1984-1986 (in Rs '000)**

	1984	1985	1986
Coconut	6,238	8,645	9,634
Rubber	20,967	17,600	17,533
Tea	7,198	15,145	8,905
	<u>34,403</u>	<u>41,309</u>	<u>36,072</u>

The expenditure on the rubber extension facility was relatively higher than for other crops. The research expenditure of the major plantation industries was Rs. 54 million in 1984, in comparison to Rs. 34 million, for the extension service expenditure in this sector.

2.4.4. Extension Service in the Coconut Industry

About 22 percent of the total cultivated land in the country is under coconut. The prime coconut areas are mainly confined to the Western, North-Western and Southern provinces. About 2/3 of the coconut area is concentrated in the three administrative districts of Kurunegala, Puttalam and Gampaha, north of Colombo. The others cover the coastal belt south of Colombo through Kalutara, Galle, Matara to Hambantota, and the Ratnapura and Kegalle districts. One of the important features of the coconut industry, is the number of small holdings of 1-10 acres extent. About 10% of the total extent under coconut comprise of such small holdings, which incidentally represent 96% of the total number of coconut holdings. The vast spread of coconut holdings traversing several unique agro-ecological systems, demands a responsive multidimensional and a highly motivated field extension service. Has the current extension facility, or can the present structure meet these demands?

Until about 1972 the extension service of the coconut industry was handled by the Advisory Division of the Coconut Research Institute. Being close to the research divisions, this advisory service had the benefit of constant updating of information. However, with the creation of the Coconut Development Authority, the four functional units of research, advisory, processing and marketing were disengaged and allocated to four satellite statutory boards, thus virtually divorcing the information transfer system from scientific research. There may be many valid arguments for this bifurcation, nevertheless as will be seen later (see para 6.4), there has been some negative effects on promotion of technology utilization.

The extension services for coconut are currently provided by the Coconut Cultivation Board, which also handles the subsidy schemes and distribution of planting materials and fertilizers for coconut growers. The extension activities of the Coconut Cultivation Board are carried out under 20 Assistant Regional Managers and 155 divisional level coconut development officers who are assisted by about 100 field assistants. The number of coconut development officers per region varies from 5-25 depending on the extent of coconut land. The range of a field assistant is around 1250-1700 ha. of coconut land. In villages the number of small holdings can vary between 2000-6000.

The number of field level extension officers in the different districts are as follows: Kurunegaja 58, Puttalam 22, Gampaha 34, Galle 16, Kegalle 16, Kalutara 16, Hambantota 16, Batticaloa 12 and Ratnapura 10. The other districts had less than 10 field officers per district. The extension activities consists primarily of group discussions, training courses, demonstrations, field days and advisory visits to farmers. The advisory visits are the primary extension activities, while group discussions and field days come next in order of importance.

Table 2.7 gives the variety and extent of extension activities performed by the Coconut Cultivation Board during 1985 and 1986.

TABLE 2.7
EXTENSION ACTIVITIES UNDERTAKEN BY
COCONUT EXTENSION SERVICES DURING 1985 AND 1986

	1985	1986
Advisory visits (individual)	67,477	740,225
Group discussions/meetings	909	2,022
Field days	524	449
Radio programmes	---	4
Film shows	---	12
Exhibitions	20	35
Demonstrations	---	241
Other formal training etc.	715	576

The expenditure incurred in extension services in the coconut industry is given in Table 2.8. The expenditure on R & D in the sub sector was about four times that of extension work for the year 1984. (R & D expenditure in the coconut industry was nearly Rs. 24 million (6)).

TABLE 2.8
EXPENDITURE IN COCONUT EXTENSION ACTIVITIES FOR 1984-1986
(Rs. '000)

Type of Expenditure	Recurrent		Capital		Total	
	Year	Salary	Other	Equip		Other
1984		5017	1171	34	15	6237
1985		6019	2527	72	28	8646
1986		6939	2645	4	7	9595

2.4.5. Extension Service in the Rubber Plantation Industry

Rubber is considered to be the second most important tree crop next to tea, accounting for 23% of the total foreign exchange earnings during 1980-82, and being responsible for 13% of total employment. The extent of rubber land under cultivation was estimated about 457,000 acres which was about 11% of land under cultivation. Unlike the coconut

small holdings; rubber holdings under 10 acres was 32 percent. The rubber plantations are spread throughout the districts of Kalutara, Ratnapura, Colombo, Gampaha, Galle, Matara, Monaragala, Badulla, Kandy, Matale and Kurunegala with a greater concentration around Kalutara, Kegalle, Ratnapura and Galle Districts. The extension services for the rubber industry is handled by the Rubber Advisory Services Department of the Rubber Research Board and headed by a Director. It is linked to the Rubber Research Institute, but runs as a parallel organisation. There were 72 rubber extension officers in 1987. They were assisted by 38 rubber extension assistants and 16 processing advisers. The minimum qualification for the recruitment of these officers and assistants is the General Certificate of Education.

The major objective of the rubber extension programme is to improve yields by the introduction of high yielding and disease-resistant clones, systematic application of fertilizers and the improvement of other management practices such as tapping and quality production of rubber.

The expenditure incurred in extension activities in the rubber plantation industry is given in Table 2.9.

TABLE 2.9
EXPENDITURE IN RUBBER EXTENSION SERVICES FROM 1984 TO 1986
(in Rs.'000)

Year	Recurrent		Capital		Total
	Salary	Other	Equip	Other	
1984	6170	3293	465	11039	20987
1985	7773	5212	138	4477	17600
1986	7496	4871	138	5028	17533

The expenditure on extension services was poor in comparison with the research expenditure on rubber. The major extension activities in rubber included advisory visits, demonstrations, group discussions, field days, exhibitions and film shows. The distribution of fertilizers and planting materials was also a major task of this service. However, unlike in the case of tea and coconut, the fertilizer recommendations for rubber, especially for the larger estates are given directly by the Soils Division of the R.R.I.

The scheme evolved by the R.R.I. to recommend fertilizer treatments for individual estates based on leaf analytical data is a recent development which is bound to be studied critically by plant nutritionist and soil scientist in other crop research institutes. The mass scale leaf nutrient surveys are carried out once every three years, and therefore the fertilizer recommendations based on these data are presumed to be valid for three years.

The breakdown of extension activities carried out by the rubber extension service is given in Table 2.10

TABLE 2.10

EXTENSION ACTIVITIES CONDUCTED BY THE RUBBER ADVISORY SERVICES DEPARTMENT OF THE RUBBER RESEARCH BOARD FROM 1985-1986.

	1985	1986
Advisory visits	49,123	52,892
Group discussion/meetings	745	1,449
Field days	58	89
Radio programmes	---	---
Film shows	176	300
Exhibitions	22	21
Demonstrations	5,194	8,566
Linning & soil conservation visits	4,583	5737

Table 2.11 shows the major inputs to replanted areas in the selected project districts of Kalutara, Kegalle and Ratnapura.

TABLE 2.11

THE DISTRIBUTION OF PLANT MATERIAL & FERTILIZERS FOR THE RUBBER INDUSTRY DURING 1984-1986

	1984	1985	1986
Fertilizer (kg)	2,150,200	2,922,970	4,465,140
Plant materials	1,129,221	1,415,398	1,204,040

Rubber extension services are also supported by other government agencies such as the Rubber Control Department, Agriculture Development Authority, State Plantation Corporation, Agrarian Service Department and the Export Development Board. The difficulties in co-ordinating the range of extension activities such as subsidy distribution, planting material, and other administrative work, have reduced the effectiveness of extension activities of the rubber industry.

2.4.6. Extension Service in the Tea Industry

Tea is the most important export crop in Sri Lanka employing about 11% of the national workforce. With 230,000 hectares under cultivation in 1987, the tea plantations cover nearly 3.5% of the total land area of the country. However, major tea growing areas are confined to the central hill country. About 27 percent of the tea area comprises of holdings under one hectare in extent.

The extension activities in tea are conducted by the Advisory Division of the Tea Research Institute, as well as by a separate organization called the Tea Small Holdings Development Authority (TSHDA). The extension division of TRI is headed by a Senior Advisory Officer and assisted by 11 Advisory Officers and 6 Extension Officers. The Tea Small Holdings Development Authority employed 77 Regional Extension Officers in 1987. The Tea Small

Hodings Development Authority concentrates on small holders, while the Advisory Division of the Tea Research Institute concentrate on the large tea estates. The extension officers attached to the TSHDA are recruited with the diploma in agriculture as the minimum qualification, while most of the advisory officers in Tea Research Institute are holders of university degrees.

The extension functions of Tea Research Institute include advisory visits, technical advise by correspondence, publication of advisory leaflets, organisation of field days and training of tea industry officers. These advisory officers are not involved, in the distribution of subsidies and planting material.

The advisory and extension service provided by TRI for the years 1985 and 1986 are given in Table 2.12.

TABLE 2.12

ADVISORY & EXTENSION SERVICES OF THE TRI 1985-1986

	1985	1986
Advisory letters	1,855	2,146
Visitors to ext. service	2,256	1,899
Visits by staff	469	580
Meetings seminars, training programmes etc.	95	201
Commercial nursery inspections	123	125
VP plants issued	380,690	1,246,990
Seeds sold	341,543	947,887
Cuttings	1,200,000	971,405

The trends in respect of the issue of planting material is partly a reflection of the enhanced rehabilitation activities in the industry during 1986.

The Tea Small Holdings Development Authority conducts field days, seminars and advisory visits as part of the extension programme. Unlike their counterparts in the T.R.I., the extension officers of TSHDA are also involved in the distribution of subsidies and planting materials.

The frequency of extension activities of TSHDA for 1985-1986 is given in Table 2.13.

TABLE 2.13

ADVISORY & EXTENSION SERVICE BY TEA SMALL HOLDINGS DEVELOPMENT AUTHORITY 1985-1986

	1985	1986
Advisory visits	21,850	26,994
Group discussions & meetings	128	435
Field days	61	86

The advisory visits are generally coupled with subsidy inspections. The quantity of VP, tea plants distributed by the TSHDA was less than a third of that of the TRI during 1986. The total expenditure on extension activities by the TRI and TSHDA are given in Table 2.14

TABLE 2.14
EXPENDITURE OF EXTENSION SERVICES IN TEA INDUSTRY
1984-1986 (Rs. '000)

Year	Recurrent		Capital		Total
	Salary	Other	Equip	Other	
1984	1445	4051	2580	---	8076
1985	3395	10944	2859	---	17198
1986	4475	5159	2562	---	12196

In relation to 1984 R & D expenditure in tea research, the expenditure on extension service was about Rs. 1 million less than for research expenditure.

2.4.7. Extension Activities in Minor Export crops

The Minor Export Crops have taken an important role in the economy in recent years, with enormous potential to increase its present export share of about 5% of agricultural export. It is estimated that about 150,000 acres are under minor export crops, spread over the following districts.

Kandy	Moneragala	Kalutara
Matale	Ratnapura	Galle
Kurunegala	Kegalle	Matara
Nuwara-Eliya	Gampaha	Hambantota
Badulla	Colombo	

The minor export crops comprise of five spice crops (cinnamon, pepper, cardamoms, cloves, and nutmeg), two beverage crops (coffee and cocoa) and three industrial crops (citronella, lemongrass and papaw). The crops are mainly found in wet and intermediate zones.

The extension services are handled by 20 Assistant Directors of extension and about 180 diploma or degree holder-extension officers attached to the Minor Export Crops Department. However, the bulk of the extension activities are handled by staff of the Extension Division of the Department of Agriculture. The functions of the extension service consist of advisory visits, farmer-training, field days, group discussions, demonstrations and organization of radio and TV programmes. The distribution of plant material is also a significant function.

2.4.8. Extension Service of the Ministry of Fisheries

Fish and fish products provide over 60% of the animal protein requirement of the people. Fishery industry employs over 100,000 persons and brings a substantial amount of foreign exchange, the value increasing from US\$ 1.8 million in 1972 to US\$ 21.3 million in 1986(9).

Domestic fish production increased steadily from 165,700 tons in 1979 to 218,500 tons in 1983. Since then the total production has varied largely due to surveillance activities in the Northern and Eastern coasts. The increase in production has been primarily due to more efficient fishing crafts and gear provided under concessionary credit schemes.

The extension services in the fisheries sub-sector are handled by the Inland Fishery Division, Marine Fishery Division and the Training and Education Division of the Ministry of Fisheries. The field level extension officers available at the Inland Fishery Division consists of 42 aquaculturists and 64 fisheries inspectors during 1987. The aquaculturists in the extension service possess a tertiary level education, while the fisheries inspectors are recruited with educational qualifications at the secondary school level. The expenditure on extension incurred in the sub-sector exceeds little over Rs. 1 million. The major extension activities of the Inland Fisheries Division include groups discussions, lectures, training courses, seminars, workshops and exhibitions. One of the major task of the extension division is to distribute the finger-lings. About 4.9 million fingerlings were distributed in 1984, increasing to 6.9 million in 1985 and to 6.2 million in 1987. The extension division also undertakes the stocking of perennial tanks with suitable fish fingerlings, and provides advice on pond construction and fish culture to rural farmers. Other extension and advisory activities of the Inland Fishery Division focus on the pond fish culture, cage/pen culture technique development, staking of seasonal tanks, rational harvesting from perennial tanks, and fisheries management.

The extension and advisory activities conducted by the Training and Education Division involve the development of the fishing industry. Their tasks include the promotion of modern fishing techniques among local fisherman, organization of extension courses for marine and inland fisherman, development of commercial fishing programmes, and drawing up of training courses in fishing gear and modern techniques of fishing. The expenditure in fishery extension and training has varied from Rs. 6.7 million in 1984 to 6.9 million in 1986.

The institutional infrastructure available for the extension services described above provides a formal mechanism for the diffusion of innovations and new techniques required for the adoption by fisherman.

However, with the aid of the Fisheries Social Development Organizations and the Fisheries Co-operative Societies better amenities and facilities for fishing are to be provided to supplement family incomes.

2.5 ORGANIZATIONAL — RELATED INDICATORS FOR EXTENSION ACTIVITIES

The organizational structures available for extension services can be effective to different degrees. The availability of resources, organizational objectives, management controls, integration with related institutions are important in the evaluation of the effectiveness of organizational structures. Several indicators are developed to identify the relative importance placed on the extension activities in different institutions. Table 2.15 indicates the institutional capacity for resource allocation for extension services.

TABLE 2.15

**PER CAPITA EXPENDITURE FOR AGRICULTURAL EXTENSION SERVICES
FROM 1984 - 1986 (in Rs. '000s)**

Extension Institutions	Average per capita Expenditure		
	1984	1985	1986
Dept. of Agriculture	27	33	31
Dept. of Animal Health & Production	28	23	29
Ministry of Fisheries	22	14	17
Inland Fisheries Division	11	11	19
Coconut Cultivation Board	23	31	35
Rubber Advisory Services Dept.	166	132	139
Tea Research Inst.	256	682	352
Tea Small Holdings Dev. Authority	11	27	43
Dept. of Minor Export Crops	18	22	26

While most extension services spend between Rs. 10,000. to 30,000 per extension worker, the rubber and tea extension services incurred much heavier expenditure per extension worker. This high expenditure for tea and rubber can be attributed to high capital investment, relatively low employment of extension workers, and the supplementary work involved in the distribution of agricultural inputs such as fertilizers in project areas.

The intensity factor of extension services in a few selected extension organizations is given in Table 2.16. These indicators are only proxies for the extension activities carried out by these organizations, and hence should be considered as partial indicators for services provided by the institutions.

TABLE 2.16

**INTENSITY OF EXTENSION ACTIVITIES IN SELECTED EXTENSION
INSTITUTIONS**

	No. of Individual Advisory Visits per Ex. Worker		No. of Group Meetings per Ex. Worker	
	1985	1986	1985	1986
Coconut Cultivation Board	246	270	3	7
Rubber Advisory Service Dev. Authority	390	420	6	12
Tea Research Institute	26	31	5	11
Tea Small Holdings Dev. Authority	284	351	—	6

The fewer visits by the advisory officers of T R I is obviously related to its limited role in providing services to the larger estate holdings on specific requests.

The other extension activities organized by the extension service institutions were relatively small. Among such activities were field days and radio programmes. It has

been reported that field demonstrations take a significant proportion of the effort of extension officers. However, the preference accorded for different extension service activities varied with the organization. In general advisory visits by extension officers was the most frequently employed mechanism for extension work.

The ability to perform a range of communications activities depend not only on the human and financial resources available in the institutions, but also on the farm size and concentration of farmers within the area of operations. The extension officers also undertake a certain amount of non-technical activities in the diffusion of innovations, as for example the distribution of planting material and fertilizer. The effort in such roles are illustrated in Table 2.17

TABLE 2.17

DISTRIBUTION OF FERTILIZER & PLANTING MATERIAL PER EXTENSION WORKER IN SELECTED EXTENSION INSTITUTIONS

(Fertilizer in metric tons)

	Fertilizer			Plant Material		
	1984	1985	1986	1984	1985	1986
Coconut Cultivation Board	15	18	17	5,810	7,171	5,456
Rubber Ad. Ser. Dept.	17	23	35	8,962	11,233	9,556
TRI	—	—	—	—	18,975	54,882
Tea Small Holdings Dev. Authority	29	27	29	3,562	4,438	3,987
Dept. of Minor Export Crops	—	—	—	15,553	17,453	14,142

The information presented above show the disparity in the institutionalized framework for dissemination of new knowledge to users. However, a direct comparison among the different models of information dissemination cannot be made due to the heterogeneity of cropping systems involved, the diversity of functions performed by the extension personnel and the differences in the educational levels of personnel involved in the information transfer chain. Yet at least in certain instances, it appears that undue emphasis has been placed on institutionally identified set of farmer needs rather than a diffusion of new technical information, which require clear perception, translation and physical demonstration of thoughts.

Chapter 3

THE ROLE OF EXTENSION OFFICERS IN THE DIFFUSION OF SCIENTIFIC INFORMATION

3.1 THE CONVEYOR SYSTEM

The new knowledge generated in the research laboratory, once transliterated into techniques, formulations, innovations etc., has to be popularized and transferred to the end user, who in the field of agriculture, is the farmer. The mode of conveyance of this new information is the extension service unit and its advisory staff.

As discussed in the previous chapters, the mode of conveyance, the technique of transfer and the manner of dissemination, is influenced by many factors, one of which is the type of crop and cropping system.

On the other side of the scale it has to be noted that the information perceived by the end users could originate from many extension as well as non-extension sources. While some farmers tend to seek information actively from any available source, others need to be motivated to respond to new information. This is particularly so in rural societies where socio-cultural taboos dominate, and where the literacy levels are substantially low.

On the other hand, the social fabric of the rural organization which by tradition promotes solidarity and understanding, and hence offers unique opportunities for regular contacts, can catalyse knowledge transfer more effectively than through formal means. Such an involuntary social intelligence network has been in existence for generations, and has been the traditional mechanism for information exchange.

In this chapter, the role of the extension officer in the diffusion of new knowledge is examined, through a survey of nearly 850 extension officers attached to several different advisory services.

The quality of services provided, type of service, institutional and personal commitment, ability and approaches in the transmission of knowledge, personal relationships and interpersonnel communication linkages and general restraints in the acquisition, perception and transformation of S & T knowledge are examined in the study. Due to financial constraints, the survey, was focussed largely on the rubber advisory services, and the extension services provided by the Department of Agriculture, which were more responsive to the survey. Although the study attempts to examine the differences in various institutions and categories of extension officers, no attempt has been made to study them in isolation.

3.2 THE MANPOWER RESOURCE AVAILABLE FOR EXTENSION SERVICES

The number and quality of staff in the extension service gives some indication of the thrust in the dissemination of information. However, these factors alone do not reflect sufficiently the intensity of extension activities. It is obvious that experience, commitment to service and ability to communicate and convince farmers, play a very significant part in the transfer of knowledge. These factors however, are not easily measurable, although some circumstantial factors could be used to make inferences.

Table 3.1 below classifies the manpower resource in extension services by educational background, to provide a measure of the quantity and quality of personnel currently involved in the transmission of new knowledge.

TABLE 3.1
NUMBER OF EXTENSION STAFF AT FIELD LEVEL BY
DEPT. AND BY QUALIFICATIONS

	With Degree	Diploma	GCE(AL)	GCE(OL)
Dept. of Agriculture	—	—	—	2,312
Livestock Dev. Board	—	601	—	—
Rubber Advisory Services Dept.	—	—	88	38
Coconut Cultivation Board	—	20	155	101
Tea Research Institute	17	—	—	—
Tea Small Holdings Dev. Authority	—	73	—	—
Minor Export Crops Dept.	—	143	—	—
Fisheries Dept. - Inland Fisheries	42	—	64	—
Education & Training	24	—	230	—

It is clear that while some institutions like the Tea Research Institute have engaged advisory officers with higher academic background, a few other institutes engaged personnel with only the General Certificate of Education (Ordinary level) qualification. This wide disparity in the academic background of field level advisory staff may be construed to reflect a sharp distinction in the quality of services offered. On the contrary, it only articulates the level of attention that is required to deal with different agricultural systems, and crops. A system involving a complex cropping technology could be expected to have suitably qualified advisory officers. A higher academic background does not necessarily mean a higher quality of information transfer. However, a sound academic training in a relevant field would facilitate the understanding of the principles involved in the new knowledge or innovation generated, and thus aid the process of information transfer. On the other hand the village level extension personnel employed by the Department of Agriculture (KVSNS) with their lower educational qualifications, could be better suited and more appropriate to the type of farmer and cropping system that they are expected to interact with.

Tertiary level training is provided by the Agriculture Faculties of the Universities of Peradeniya and Ruhuna, and the Postgraduate Institute of Agriculture at Peradeniya, while specialized training in agriculture at the secondary (vocational) level are provided by the School of Agriculture and the Practical Farm Schools run by the Department of Agriculture. These institutions provide diploma certificates which enable recipients to be directly recruited as field level advisory officers.

Many of the field level extension workers have reported that they do not receive adequate training, referring mostly to in-house reorientation training programmes. This is undoubtedly a very important aspect, since failure to update regularly the technological information base, leads to degeneration of the transfer mechanism.

The sample survey revealed that female advisory staff was only 17 percent of the total. Likewise it showed that nearly 42 percent of the extension staff had work experience of less than 2 years, while 36 percent had 2-5 years of experience in the region and only 22 percent had more than 5 years of experience. Work experience within a region could be advantageous if the officers concerned have been able to integrate socio-culturally with the local farming communities.

Another aspect that affects information transfer, is the on-site presence of field level advisory personnel. Different categories of extension staff are expected to reside within their specified ranges, and this is in some cases facilitated by the offer of staff quarters in proximity to their respective offices. In the current survey, it was noted that nearly 43 percent of extension officers resided within their ranges, 13 percent travelled a distance of 1 to 5 kilometers, 10 percent commuted 6 to 10 kilometers, 17 percent travelled 11 to 20 kilometers and 17 percent had to commute more than 20 kilometers to get to the range.

Apart from the daily score of travel to the range, these officers are expected to perform a certain amount of travel within the range. However, in most instances, mobility is severely restricted due to the costs involved, and this aspect has been cited as one of the serious constraints to the performance of duties. However, it could very well be argued that if the scientific information offered by research laboratories is demand oriented, the relative immobility of extension personnel would not be a constraint due to the emergence of a knowledge-seeking culture, drawing farmers to the sources of information.

3.3 TYPE OF CONTACT WITH FARMERS

Knowledge transfer would best be performed through direct personal interaction (10), in which social barriers are disregarded and mutual understanding established to facilitate acceptance of technological changes. Conservatism and traditional beliefs generally tend to promote suspicion and resistance to change. Hence the unexpressed mode of operation of any category of extension personnel is the initiation of a confidence building programme of activities. Many different approaches are available in general practice. The most effective process in the rural scenario, is the participation in social gatherings, such as weddings, village fairs, sports meets etc.

Once a certain degree of confidence and mutual respect has been built up, interactions become frequent and easier. The hidden danger in this approach is the unwitting tendency towards favouritism, a situation which would nullify the progressive approach towards closer interactions.

While some farmers are liberal-minded and open for change, others through conviction, faith and traditional beliefs are resistant to any new order. Likewise, while some farmers are passive and need to be motivated others are alert, receptive and go in search of new developments. When returns are high individual farmers will seek information profitable for them(4).

As pointed out in section 2.3.1 there are several methods available for dissemination of information, of which the method of direct contact has been said to be the most effective

and popular. The process of direct contact can take place, through any of the following methods:- home visits, office calls, telephone messages, field demonstrations and correspondence. The respondents to this survey have indicated that as far as feasible, they have attempted direct personal contacts. Some preferred farm visits and office calls. Such visits are generally carried out at regular intervals, often at weekly intervals. However, the mechanisms vary with different institutions. In some extension organizations, individual contacts are irregular, but more farmers are reached using group contacts, which either involve practical demonstrations or group meetings. The group meetings take the form of lectures, panel discussions symposia open forums, group interviews, debates, program planning meetings, review meetings and tours.

The transfer of information to farmers also take place through radio and television transmissions and through the national newspapers. Serialized and regular time series transmissions through radio and TV, on agricultural programs for farmers are now becoming common and popular. In fact as a further boost for agricultural extension, plays and dramas based on rural farming communities are now frequently broad-cast or telecast over the national radio and TV. Such information transfers are generally used to supplement other extension methods. Visual methods in the extension service activities were used only to the extent of about 30 percent due to lack of equipment and facilities.

The frequency with which extension personnel meet farmers in their fields varies. The study showed that about 20 percent met farmers daily, while 45 percent met at weekly intervals, about 19 percent at monthly intervals, 6 percent at quarterly intervals and 10 percent at half-yearly intervals.

The frequency of direct contacts was affected by the official position and status of the personnel. In general the higher the rank of the officer in the extension service hierarchy the lesser the frequency of contacts. This is understandable, since the higher ranking officers get engrossed more and more on administrative, managerial and supervisory functions, than on field extension work. It is also inevitable that the efficient and motivated field extension workers get withdrawn from the field more frequently than the others, through merit promotions, to lucrative administrative positions. This situation tends to deplete the ground level cadre of the better quality extension personnel.

The most frequently undertaken advisory service activity is the organization of field days, which is followed by group meetings and group training courses. The activities with lesser frequencies are film and video shows, scientific lectures and panel discussions.

The number of farmers or farming units, and the intensity of agricultural activity within an extension officers range varies widely. The coverage depends on several factors, of which the main one is the cropping system. Thus in the case of plantation crops, the study showed that on an average, each field level advisory officer has to cover about 500 small holdings and about 50 estates (i.e. plantations over 8.5 ha). While in the case of food crops handled by the Department of Agriculture, each advisory officer has to deal with a variable number ranging from about 1000 to over 2500 farmers.

The coverage also depends on the extent or spread of land area under a particular cropping system, and also on the level and status factor of the ground level advisory officer.

The table below indicates broadly the diversity of coverage of the ground level advisory officers included in the Survey.

TABLE 3.2

COVERAGE OF FARMERS BY EXTENSION OFFICERS (E.O.s')

No. of Farmers		Percentage of E.O.s' Covering the Range	
Less than 500	—	—	23
501 — 1000	—	—	17
1001 — 1500	—	—	13
1501 — 2500	—	—	12
over 2500	—	—	34

3.4 RECEPTIVITY TO EXTENSION OFFICERS' ADVICE

A self-assessment by the extension officers of their influence in the information transfer, provides interesting data. About 80 per cent of the extension officers have indicated that a large proportion of farmers tend to accept their recommendations relating to cultivation practices. But lesser numbers adhere to advice on the use of agro-chemicals, fertilizers, replanting, interplanting and other agricultural operations. According to the E.O.s', farmers have accepted their recommendations for many reasons other than for the scientific and technical content of the message. Where farmers are strongly dependent on state subsidies for productivity, then the main motive force seems to be such assistance. On the other hand, where the subsidy is not a dominant issue, the decisive factor for the use of agricultural inputs is the brand name and quality of product. Hence advertising of agro-chemicals and other inputs, have also an influence on the farmers desire to accept the advice of advisory officers. This is indeed an unfortunate situation, since sometimes the influence of the agrochemical industry can undermine the puritanic approach to rural agriculture through the use and dependence on environmentally harmful chemicals. In other words certain exogenous influences which may sometimes be self-seeking, may force the farmers to become virtual prisoners of an alien technology culture.

Table 3.3 summarizes the E.O s' assessment of how the farmers respond to their advice.

**TABLE 3.3
ACCEPTANCE OF ADVICE BY FARMERS**

	E.O.s' Assessment of Farmers Receptivity				Total No. of E.O.s'
	Considered not important		Considered important		
	No.	%	No.	%	
Cultivation practices	19	20	76	80	95
Use of fertilizers	26	27.4	69	72.6	95
Replanting & Interplanting	40	48.2	43	51.8	83
Agricultural processes	29	42	40	58	69
Other operations	27	34.2	52	65.8	79

Many farmers have faith in scientific methods, and are prepared to accept demonstrable benefits of scientific research, although occasional failures have caused some set backs. The most recent such disaster was the case of clones RRIC 103 and PB 86 which though considered high yielding and resistant to disease, appeared very susceptible to the *Corynespora* disease.

The Table 3.4 analyses the E.O.s' impressions on why and how their recommendations are accepted by farmers in general.

TABLE 3.4

E.O.s' ASSESSMENT OF THE REASONS FOR ACCEPTANCE OF ADVICE BY FARMERS

Reason	E.O.s' Response	Percentage
1. Faith in scientific methods	21	14.3
2. Respect for authority	2	1.4
3. Personal attachment	5	3.4
4. Usefulness of advice	11	7.4
5. Combination of 1 & 2	10	6.8
6. Combination of 1 & 3	23	15.6
7. Combination of 2 & 3	2	1.4
8. Combination of 1, 2 & 3	69	47.0
9. Other reasons	4	2.7
	147	100.0

The data indicates that a combination of factors dominated by faith in scientific methods determines the receptivity of farmers to new knowledge. This shows that farmers are conscious about the quality of the message, and are genuinely interested in understanding the relevance of such advice in increasing productivity. Big land holdings are very much dependent on scientific advice. Infact in the case of rubber, as pointed out earlier, the fertilizer programmes of the estate sector are currently totally dependent on direct advice given by the Soils Division of the Rubber Research Institute. However, it is the small holder who needs to be persuaded and motivated to receive and accept new knowledge.

3.5 REASONS ADDUCED FOR IGNORING THE ADVICE OF E.O.s'

In the opinion of more than 80 percent of the E.O.s' surveyed, at least a fourth of the farmers preferred to ignore their recommendations; others thought that a lesser number ignored their advice. However, the tendency to disregard advice is sometimes influenced by external factors such as adverse weather conditions and poverty.

Table 3.5 summarizes the extension officers' assessment of the farmers' tendency to disregard advice.

TABLE 3.5

TENDENCY TO DISREGARD THE ADVICE OF EXTENSION OFFICERS

E.O.s' Assessment of the Percentage of Farmers Preferring to Ignore their Advice				
	Everyone Ignored %	50% preferred to ignore %	Only a few Ignored %	None Ignored %
Cultivation practices	1.2	16.2	71.3	11.3
Use of fertilizers & agro-chemicals	2.6	23.0	64.1	10.3
Replanting and Intercropping	6.8	12.3	69.9	11.0
Agricultural processes	1.8	12.5	73.2	12.5
Other reasons	11.8	16.9	57.8	13.5

About 12-23 percent of the Advisory Officers thought that generally around 50 percent of the farmers and farming units disregard their advice. Less than 12 percent of the E.O.s' believed that all farmers tend to ignore new knowledge and innovations. However, around 50 - 70 percent of E.O.s' felt only a few farmers ignored their advice. It seems an inescapable conclusion that farmers are not prepared to sit back and accept any changes without adequate evidence of reliability. It is known that farmers become aware of many new innovations in the market place and at gatherings such as betrothals, temple ceremonies etc., but once convinced they make no pretences of their conscious choice of technologies.

Table 3.6 summarizes the main reasons for disregarding new scientific knowhow and innovations.

TABLE 3.6

REASONS FOR DISREGARDING ADVICE OF EXTENSION PERSONNEL

Reason	Percentage
Adherence to traditional beliefs	— 31
Lack of confidence in new methods	— 24
Lack of respect for authority	— 16
Personal pride/sense of maturity	— 15
External factors (e.g. poverty and adverse weather conditions)	— 2

It significant to note that according to the E.O.S' about a third of the farmers were quite conservative and hesitant to change, mainly due to strong traditional beliefs. Other reasons adduced for disregarding new recommendations include, self-confidence of some of the more experienced and mature persons, lack of respect for authority (which is related to the bureaucracy of a hierarchical information transfer system), lack of confidence in new materials, methods and techniques, most of which inevitably require higher management levels and larger inputs.

3.6 METHODS FOR NEED IDENTIFICATION

Most of the methods available for information transfer are also used for need identification of farmers. These include personal contacts, group meetings, visits, office days, demonstrations etc. However, these methods do not employ an organized scheme for communication of problems, and for the upstream flow of identified needs. In fact the study has not revealed the existence of an autonomous feed back mechanism for farmers problems, or even a formal arrangement for need identification. It has to be recognized that farmers problems evolve from hands on experiences, and are not on scientific and statistical deductions; but at the same time these are far from speculative. Such circumstances makes the upstream feedback a complex issue, because whilst research institutes may expect a farmer's problem to be structured and presented as a scientific challenge, the ground level extension personnel may lack the competence and knowledge to assimilate and transliterate these messages in their correct perspective. The Table 3.7 summarizes the extension officers impressions of the manner in which farmers' needs are identified.

TABLE 3.7.

MEANS OF IDENTIFYING AGRICULTURAL PROBLEMS OF FARMERS BY EXTENSION OFFICERS

Method	Percentage
Purely on personal contacts	4.6
Purely on group meetings	7.3
Individual and group meetings	65.6
Other methods	21.5
	100.0

The Training and Visit (T & V) System adopted by the Department of Agriculture provides greater opportunities for interaction of extension personnel with groups of farmers. However, the dynamism of the extension personnel is a major determinant of need identification and upstream transmission of field level problems to the researchers.

The Regional Technical Working Groups established by the Department of Agriculture play a significant role in identifying farmers problems. These Working Groups meet prior to the major cultivation seasons (Yala and Maha) to identify needs, and set specific targets and work-norms for the different farming systems. These meetings provide opportunities for extension personnel to meet the Regional Director of Research, Assistant Directors of Extension, Agricultural Officers, Specialists and Subject Matter Officers and other senior research officers. However, the grass root level personnel such as the K V S Ns' do not get an opportunity to meet these higher ranking officers to present their own views directly.

The advisory units of other organizations have similar mechanisms for need identification of farmers in the respective crops, although not as regular and intensive as the programme of the Department of Agriculture for short term food crops.

3.7 FARMERS RESPONSE TO TECHNOLOGICAL CHANGES

The traditional Sri Lankan farmer had only a distant linkage with science. His appreciation of science was only in a crisis situation when through desperation he sought relief measures to overcome an impending disaster. This situation has changed somewhat over the past few decades, due to heavier demands on land, decline in productivity, increasing vulnerability of crops to pests and diseases, declining prices in real terms of commodities, increasing costs of agricultural machinery, equipment and essential inputs, and above all the new awareness of the potentials of science and technology.

It is recognized that the progressive transformation from shifting cultivation to the present day organized intensive multiple cropping systems, is a great stride forward in coping with these constraints; yet at the same time increasing pressure for science-based changes has tended to make the traditional farmer increasingly dependent on the science and technology system.

Yet for all there has not been a very significant thrust for a closer relationship between the farmer (as a user of products of science) and the researcher (the producer of scientific innovations). Except in the case of the estate sector, where the farmer (or planter as he is usually known), generally prefers to have direct contacts with the researcher than through the intermediary of the extension officer, little or no contacts are made between the small time farmer and the researcher.

This alienation of the scientist from the farmer, possibly an inherited trait from colonial times, has been an unfortunate barrier to a direct exchange of views on needs and problems. Amidst this isolation, is the lack of confidence and understanding among some farmers of new technological innovations, some of which though proven to have a demonstrable advantage over currently existing technologies, have been subjected to disastrous mishaps. Table 3.8 summarizes the impressions of extension personnel on the reasons for not following the advice given by research staff.

TABLE 3.8

**REASONS FOR NOT FOLLOWING THE ADVICE OF RESEARCH STAFF
(SUMMARY OF VIEWS EXPRESSED BY EXTENSION PERSONNEL)**

Reason	Percentage of E.O.s' agreeing
Failures of previous instructions at field level	— 3.7
Farmers have already learnt it from previous experience	— 3.7
Impracticability of research concepts	— 40.8
Non-relevance to field problems	— 44.4
Lack of means to implement	— 3.7
Non-availability of recommended inputs	— 3.7
	100.0

The data above shows that in the view of the field extension staff, impracticability of research concepts and the irrelevance of the solution to the field problem, were the major reasons for farmers not abiding by the advice offered by the research officers. If in

addition to the above constraints, the information packages are unintelligible, farmers will use different methods to implement the technological changes, resulting sometimes in different degrees of success and failures. It has been remarked that generally E.O.s are at the receiving end of adverse comments and complaints when new innovations fail to meet the aspirations and expectation of the farmers. Table 3.9 indicates the difficulties encountered by farmers in following the advice offered by research staff.

TABLE 3.9
DIFFICULTIES IN FOLLOWING ADVICE OFFERED BY
RESEARCH PERSONNEL (AS PERCEIVED BY E.O.s')

Difficulty	—	Percentage of E.O.s' agreeing
Doubtful nature of findings	—	14.0
Impracticability of advice	—	5.3
Economic viability not assured	—	21.0
Less time devoted by researches for discussions	—	5.3
Absence of field demonstrations	—	3.5
Conservative nature of farmers	—	17.5
Lack of required facilities and equipment	—	21.0
Lack of communication	—	7.0
Difficulties in field supervision	—	3.5
		100.0

The views expressed by extension personnel, especially those relating to nature of findings; economic viability and impracticability are bound to be challenged by research personnel. The contention of E.O.s' in these matters appear to be shadowed by prejudices and misconceptions, although at least in certain specific instances, the E.O.s' may be correct.

3.8 INTERACTION BETWEEN EXTENSION PERSONNEL AND RESEARCHERS

As in the case of the linkage between the farmer and the scientist the interactions between the extension personnel and scientists are affected by social and cultural barriers. This is again a major short-coming in the information flow mechanism. The new information provided to the extension personnel by the researchers needs to be clear, well explained and suitably packaged, and this aspect depends on the knowledge base of the extension personnel. It was shown in section 3.2 that the educational background of various categories of extension personnel vary vertically down within the organizational profile as well as horizontally among the different extension service organizations. Hence research scientists have to be aware of this differential, and transliterate new technological information according to the receptive capacity of the intermediary delivery system. This is an important aspect, because the farmers are not likely to accept a technological change without being fully convinced of its potential, and therefore the extension personnel must be prepared to communicate information in the most convincing manner.

Although there should be regular interactions between researchers and advisory officers, only 22 percent claim to have such frequent meetings. Among the others, 21 percent have said that meetings with researchers took place about once a year, while 57 percent had only rare interactions. Regular interactions are important not only to provide new information, but also to update and upgrade the existing knowledge base. It is interesting to note that about 55 percent of the E.O.s' thought that their training was less than adequate for their normal functions, while 37 percent were of the view that training was adequate. A smaller number (7%) was of the view that the training was quite inadequate.

Among the extension officers surveyed, 7 per cent had not participated in any training programmes during the past two years, while 58 per cent had been associated with 1-2 training programmes during the same period. 27 per cent of the E.O. s' had participated in 2-4 programmes, and about 5 percent had taken part in 4-6 programmes. It is thus evident that unless a well planned human resources development programme is conceived and implemented, the information transfer chain is likely to be dislocated.

Although 80 per cent of the extension personnel claimed that they adhered to the advice and guidance provided by the scientific researchers, at least 20 per cent of them felt that it was not possible to follow the instructions of researchers.

It was not clear whether this situation arose out of the disparity in the educational background of different categories of extension personnel, or due to the inability of researchers to communicate properly with extension personnel.

The extension officers assessment of the receptivity of researchers to farmers problems is indicated in Table 3.10

TABLE 3.10

**RESEARCHERS' INTEREST IN FARMERS' PROBLEMS
(AS SEEN BY EXTENSION PERSONNEL)**

Researchers keenness		Percentage of E.O.s' agreeing
Very often	—	50.0
Sometimes	—	29.6
Occasionally	—	15.2
Not keen	—	5.2
		100.0

A researcher's interest in the problems of farmers' depends on his field of research. Persons involved in basic type of research would not be sensitive to general field problems. This applies also to those who are motivated towards innovative or inventive research. Hence the assessment of extension officers of researchers' interest in farmers problems is subjected to this limitation. However, 56 percent of extension officers have said that they had no problem in communicating the needs of farmers to researchers, while 44 per cent of them have encountered some difficulties.

3.9 CONSTRAINTS IN THE PERFORMANCE OF EXTENSION SERVICES

In Chapter 2, some of the broad general issues affecting dissemination of information have been discussed. These include the packaging of new technological information and the possible disruptions in the conveyor system of a hierarchical information transfer system. However, at the field level there are other constraints as indicated by the extension personnel in the current study (Table 3.11)

TABLE 3.11

CONSTRAINTS IN OPERATING EXTENSION SERVICES

Constraint	No. of E.O.s' responding	As % of the total No. of respondents
Lack of interest by farmers	85	57
Lack of incentives	81	55
Lack of transport	78	53
Lack of material	77	52
Lack of supporting services	73	49
Too wide a range of activity	50	34
Poor co-ordination	46	31
Inaccessibility	43	29
Bureaucratic office procedures	35	24
Disinterest of higher officials	10	7
High non-extension work load	6	4
Others	21	14

Some at least of the farming fraternity are highly conservative and quite hesitant to reject conventional methods. The best method of convincing such personnel is through demonstrations. Many of the extension organizations have infact established demonstration plots for the benefit of farmers. Realizing the importance and effectiveness of such demonstration plots, in recent times, international funding agencies have provided substantial assistance in promoting this concept. A review of such a programme is presented in Chapter 6 of this study.

The need to have supporting services has also been voiced strongly by extension personnel. There were apparent delays in obtaining subsidies, credit facilities, insurance and marketing services. They also complained that planting materials and fertilizers were sometimes not received in time, i.e. at the officially recommended timing, thus nullifying the efforts of farmers. Although the extension personnel were expected to popularize credit and banking facilities as a means of assisting farmers to get the necessary inputs for cultivation, in practice such facilities were not within reach of the ordinary rural farmers. It has been stated time and again that bank and credit facilities were available only to a small affluent group of farmers, who had the capacity to demonstrate without any difficulty their credit-worthiness.

Extension personnel are also frequently burdened with administrative or other non-extension duties, which limit the time available for transfer of information. However, only a few have listed this as a constraint (see Table 3.11). Apparently most of the E.O. s' consider it as a part of their normal functions, and probably enjoy such diverse activities.

However, from the extension point of view, the loss of time for advisory work is a serious constraint for transfer of new knowledge. Table 3.12 below shows the percentage of time devoted for non-extension type of work.

TABLE 3.12

**TIME DEVOTED TO NON—EXTENSION TYPE OF WORK BY
ADVISORY OFFICERS**

Percentage of time devoted	No. of E.O.s' responding	As % of the total No. of respondents
1 — 25%	46	36.6
26 — 50%	37	28.3
over — 50%	41	31.3
Difficult of specify	5	3.8
	131	100.0

Among the extension personnel surveyed, 92 percent had to devote substantial amount of time on non extension work. Some of them claimed that over 75 per cent of their time had to be spent on work other than extension services. The non extension work load can be considered as a negative indicator towards the flow of information.

The extension personnel have also found that lack of official transport, lack of co-ordination within organizations and among different organizations, bureaucratic office procedure and the extensiveness of the ranges to be covered, were major constraints to transfer of information. Lack of incentives for E.O.s' has also been considered a major defect. Incentives in the form of prizes, awards, promotions, and facilities for specialized training for creative and motivated workers, have been mentioned as means for promoting an effective and efficient extension service.

Chapter 4

ASSIMILATION AND UTILIZATION OF NEW INFORMATION BY AGRICULTURAL FARMERS

4.1 THE SURVEY SAMPLE

The current study as pointed out in the introductory chapter, was largely concentrated in two agricultural ecosystems as represented in Kamburupitiya in the Matara district, and in Peradeniya in the Kandy district. The survey involved the completion of a questionnaire by users of knowhow (mainly farmers) through interviews with a research assistant, to study their problems of assimilation and utilization of new information. The sample from each location consisted of about 100 small holders and a few large estate owners. The crops cultivated by these farmers included paddy, tea, rubber, coconut, spices and subsidiary food crops. The diversity of crops cultivated and the resultant heterogeneity of cropping patterns, naturally necessitates different approaches to information transfer. This was indeed evident from the number of different extension service facilities provided in these two locations by the respective organizations.

The extension activities of the Department of Agriculture concentrated on the use of the lead farmer concept to disseminate information. However, the choice of the lead farmer, and the strategy of expecting such lead farmers to communicate without inhibitions new innovations, has its limitation and pitfalls. It is important to note that sharing of knowledge, skills and effort were commonplace among paddy cultivators in Sri Lanka, when standard and common technologies were in vogue during the first half of this century. However, today with a competitive agricultural economy, and with a range of materials, processes and technologies available, the social processes of farming have changed, virtually leaving each one to operate on his own. In the present day context sharing of information takes place more at the general level and less at the specialized level, making the rural farmer more dependent on extraneous influences. It is in this context that the diffusion process of knowledge, and its absorption and utilization by farmers has to be monitored and aligned to their needs. Otherwise they are likely to be confused and carried away by commercially-oriented audio and visual propaganda material of self-seeking interests.

4.2 ISSUES AND PROBLEMS

Assimilation and utilization of new technologies in agriculture are affected by several factors, among which are land ownership, the extent of cultivated land, economic status, family size, educational level and social background, etc.

Farmers with smaller land holdings may strive for maximum productivity with complex and sophisticated techniques of farming, but may be limited by low levels of income. Likewise land leases and tenure holdings may induce measures for maximum short term exploitation with low inputs, and less concern for a future build-up. Tables 4.1 and 4.2 show the distribution of agricultural land holdings in the two locations with respect to ownership and size of holdings.

TABLE 4.1

DISTRIBUTION OF LAND HOLDINGS AT KAMBURUPITIYA AND PERADENIYA ACCORDING TO OWNERSHIP

Type of ownership	% of holdings
Outright owners	55.6
Tenure land	37.0
Land on lease	7.4

TABLE 4.2

DISTRIBUTION OF LAND HOLDINGS AT KAMBURUPITIYA AND PERADENIYA ACCORDING TO EXTENT OF HOLDINGS

Size category of holding (in acres)	% of holdings
Less than 1	11.1
1 — 3	59.3
3 — 5	18.5
5 — 7	7.4
More than 7	3.4

The above data shows that nearly 70 percent of the farmers in the sample were small holders with less than 3 acres (1.2 ha) of agricultural land. The economies of scales of small farmers may be such that they could at most attempt to maintain only a minimum level of inputs to attain sustainable levels of profits. Any reduction in the farm inputs could adversely affect productivity and hence the family income, which would in turn cause a further reduction of farm inputs. This is the vicious cycle of events which needs to be prevented at all costs by those responsible for advising and guiding the farmers.

The Sri Lankan farming system broadly comprises of four main cropping patterns, namely, mono-cropping, inter-cropping, mixed cropping and home gardening. It is estimated that mono-cropping is practised in about 55 percent of the total agricultural land area, while inter-cropping is on about 15 percent, and mixed cropping and home gardening on about 30 percent. In recent years due to increasing pressure on agricultural lands and the continuing need to increase productivity, many of the mono-cropped lands are moving towards inter-cropping and mixed cropping. Since extension systems required for the different cropping patterns is also variable, new approaches need to be continuously developed to meet the changing patterns of agriculture.

Most agricultural operations in the country can be considered as semi-mechanical with the stress on labour intensive methods. Here again, there is currently a tendency to shift towards mechanized farming methods. Thus the tractor ploughed area of around 49

percent in 1985 has increased to 51 percent in 1987. Interestingly the buffalo ploughed land had also increased from about 36 percent in 1985 to 39 percent in 1987. On the other hand mamoty ploughed land area had decreased form 15 percent in 1985 to 10 percent in 1987.

Apart from land preparation work, other aspects of farming are also steadily becoming mechanized, indicating that at least the owners of bigger land holdings are moving away from labour-intensive farming technologies. Thus paddy harvesting using the sickle requires about 200 man-hours per hectare, or 25 percent of the total labour requirement for paddy production, and this amounts to a cost of about Rs. 740 - 865 (US \$ 26 - 30) per hectare. A mechanical harvester developed by the Farm Mechanization Research Institute has been found to reduce this cost to Rs. 290 - 370 (US \$ 9 - 13) per hectare, by reducing the manual labour requirement by 140 man hours per hectare. However, the current capital investment on this machine is about Rs. 11,500/- to 15,000/-. With the larger majority of farmers in the country owning less than 1 hectare per person, it is unlikely that a spontaneous change to technology - intensive farming could take place at the small farmer level without a major policy orientation in which some state intervention will become inevitable.

4.3 FARMER ATTITUDES TO TECHNOLOGICAL CHANGES

In the study locations of Kamburupitiya and Peradeniya, it was noted that although most of the farmers had opted for the use of tractors for land preparation work, nearly 68 percent did not own tractors; they either hired or leased the equipment. This also meant that in the absence of ready cash for hire or lease of equipment small farmers were forced to pawn their crops to meet the costs of such hire or lease. The weak resource base of the majority of farmers was therefore a matter to be considered by extension organizations in promoting advanced techniques of agriculture in rural communities. In the project areas the two wheel tractor was the main item of equipment used in land preparation, with 67 percent of the sample of farmers using this equipment. 26 percent of the farmers preferred mamoty ploughing and only 7 percent used buffalo. Table 4.3 below indicates the preferences adduced by farmers for utilizing mechanized farming.

TABLE 4.3

REASONS FOR UTILIZING MECHANIZED SYSTEMS FOR FARMING

Selection criteria	Percentage
Suitability	29.6
Convenience	40.8
Low cost	18.5
Other social factors	11.0
	100.0

Quite frequently farmers with limited resources, or with a low resource base, believing that mechanized farming could change their economic conditions, tend to imitate farmers with higher resource base and fall into difficult economic situations. However, those who did not adopt mechanization, had their own valid reasons for doing so. They argued that their land was limited, and with sufficient time available for their cultivation activities, there was no

justification to change over from the slow but low-cost manual methods to rapid but high-cost mechanical techniques. In fact as indicated in Table 4.3, it is clear that about 70 percent of the farmers agreed that suitability and convenience were the factors in favour of mechanization rather than the cost.

Paddy cultivation in Sri Lanka received its first major facelift during the decade 1950 - 1960, when through scientific selection and breeding, high-yielding varieties were brought to the front. This was followed by the second revolution, when hybridisation and breeding produced the short life, high-yielding "new improved varieties". The transformation phases from traditional breeds to new varieties was not a simple straight-forward transition. On the contrary, it needed a massive effort by the extension personnel, since the cultivation and management techniques of new varieties needed greater skills and effort. Furthermore the shelf-life qualities of many of these short-term new varieties were poor, with the result that many of the farmers began to consider these varieties as low quality paddy (*Bâ/a Vi* in Sinhala). Thus the change-over was not spontaneous and rapid. Table 2.3 in Chapter 2 shows how the change-over occurred from 1970 onwards, on an island-wide basis. However, in the project areas of Kamburupitiya and Peradeniya, as seen from Table 4.4, around 4 percent farmers still preferred to use the old traditional varieties.

TABLE 4.4

PREFERENCES OF FARMERS FOR RECOMMENDED VARIETIES OF PADDY

Type of planting material	Preferences of farmers as a percentage
Recommended varieties from agrarian services	37.0
Recommended varieties propagated by the farmers themselves	44.5
Recommended varieties obtained from other farmers	14.8
Non recommended varieties	3.7
	100.0

These farmers take pride in holding on to the old traditional varieties, which they consider as high quality premium rice. In fact it is claimed that the shift to new varieties was in some cases at least, facilitated by other compelling factors such as availability of subsidies, delivery to the door-step of inputs, greater scope for exploitation of limited land resources, etc., rather than on conviction. Thus innovations and new findings in agriculture needs equally innovative mechanisms for knowledge transfer.

Spacing and seed rates are important aspects in scientific agriculture. The Table 4.5 shows the seed rates employed by farmers in the present study areas.

TABLE 4.5**RESPONSE OF FARMERS TO RECOMMENDED SEED RATES**

Seed rates or spacing	Farmers response (%)
Recommended rate	55.6
Excess of recommended rate	37.0
Less than recommended rate	7.4
	100.0

Although more than 55 percent of the farmers preferred to use the recommended optional seed rate or spacing of plants, a significant number, especially those with small extents of land, used shorter spacing with the intention of getting higher yields. It is true that these farmers may not be convinced by the scientific implications of photo-periodism, light intensity and soil-root interactions in relation to moisture and nutrients, yet through demonstrations and discussions they could be induced to change over from close planting (of a monocrop) to mixed cropping and inter-cropping, wherever feasible.

Farmers attitude towards fertilizer usage showed that they generally adhered to recommended methods and quantities. This is illustrated in Table 4.6 below.

TABLE 4.6**RESPONSE OF FARMERS TO FERTILIZER RECOMMENDATIONS**

Recommendations	Farmers response as percentage
Used recommended method and quantity	70.4
Used recommended method but not the amount	25.9
Used neither the correct method nor amount	3.7
	100.0

It will be seen that more than 96 percent of the farmers have used the recommended methods of fertilizer applications indicating that they are convinced that the scientific method as demonstrated to them by extension personnel was acceptable. On the other hand over 25 percent have not used the recommended amount. The main reasons for this arises from the financial constraints of farmers. Generally farmers' are fully convinced of the dramatic effects of fertilizers on crop production, but their ability to meet the optimal needs depends on their financial capacities. In fact a few of the affluent farmers are prepared to apply more than the required amounts with the hope of maintaining high productivity. Others with less cash in hand may use minimal levels of fertilizers so as not to induce a decline. Sometimes, where the market for primary products fluctuate, the levels of fertilizer application will also be determined by the value for cost ratio (V.C.R.) for the crop.

The evidence presented by farmers in respect of their acceptance of scientific methods in farming is clearly in conflict with the impressions presented by the extension personnel, many of whom had contradictory views (see section 3.7.) The reasons for this sharp disagreement becomes obvious when considering the other observations made by farmers, and this brings to light a serious defect in the information transfer mechanism, which while being fragmentary, is also short of focus.

4.4 FARMERS IMPRESSIONS OF EXTENSION SERVICES

Nearly 90 percent of the farmers surveyed were aware of the extension services available through the village extension officer (KVSN). However, the linkages and relationships between farmers and the KVSNs' were weak, with around 48 percent reporting that these village extension personnel had not visited their farms. Among those farmers who had close contacts with the KVSNs' there was general agreement that the services provided by them were numerous. The general impressions of the farmers' with respect to services provided by the KVSNs' are summarized in Table 4.7 below.

TABLE 4.7

SERVICES RENDERED BY VILLAGE LEVEL AGRICULTURAL EXTENSION PERSONNEL (KVSN)

Service	Farmers' views of services provided as percentage
Crop inspection & instructions	33.3
Instructions only	14.8
Material aid	7.4
Recommending subsidies	3.7
No service	37.0
Others	3.8
	100.0

The fact that around 37 percent of the farmers surveyed had not received any benefits from the village extension workers is significant, and deserves comments and further investigations. There are at least two main causes for this disturbing situation. Firstly, the effectiveness of the concept of contact farmers in agricultural extension. It is clear that the selection of a contact farmer, who should not only be a motivated and respected member of the village farming community, but also intelligent and committed for service, is not an easy task. Secondly, although functionally each KVSN is expected to cover only 700 farmer families, in practice due to staff shortages or other causes, it was discovered that the number of farmer families covered by each KVSN in the study areas ranged from 1490 to 2066. In such circumstances it was hardly conceivable that any meaningful transmission of knowledge could take place.

A variety of approaches for propagation of information on new techniques and materials has to be employed by village extension personnel. The farmers reports of such extension services are summarized in Table 4.8.

TABLE 4.8

EXTENSION ACTIVITIES PROVIDED BY KVSNS'

Extension activity	Farmers reporting of services provided by KVSNS' (as percentage)
Farm visit	33.3
Reporting farmer needs to higher officials	25.9
Field demonstrations	7.4
Group demonstrations	18.5
Group meetings	7.4

The study revealed that KVSNS' have not always used the best approaches available but applied the most convenient methods.

Around 60 percent of the farmers found no difficulty in understanding and utilizing the information provided by the KVSNS, but 15 percent reported that they had difficulty in understanding the instructions. Other farmers preferred to be non committal in respect of the performance of extension workers. While 56 percent of the farmers said that they had faith in the new techniques and innovations introduced to them, a significant number showed no inclination to follow the advice of extension personnel.

In an attempt to assess the farmers attitude towards changing the existing traditional practices, it was observed that about 85 percent were willing to accept a change if the new alternative was demonstrably superior. However, the remaining 15 percent showed a distinct reluctance for a change, because they contended that the existing practices were quite satisfactory.

In a final aspect of the study, an attempt was made to assess the farmers awareness of ongoing scientific work in the country's research institutions. It is to be noted that most farmers were unaware of the scientific work being carried out in the research institutions. However, when briefed about these activities by the survey team, most of them responded positively by indicating their desire for new knowledge and advancement. (Table 4.9)

TABLE 4.9

FARMERS APPROVAL OF RESEARCH IN GOVERNMENT LABORATORIES

Farmer view	Response as a percentage
Research work useful	85.2
Research work not useful	7.4
Usefulness uncertain	7.4
	100.0

A general comment made by farmers was that at the field level, they carry out every possible step to increase productivity, sometimes using the most convenient methods,

but not necessarily the best method. However, they claimed that their major problems lay outside their domain, and these include delays in obtaining credit facilities, fertilizers and certified seed material, and in marketing of their produce. The purchase of vegetables, rice and other food crops under the guaranteed price scheme has many snags, with the result that farmers in many instances opt for other means for disposal of their products, which invariably result in financial losses. Farmers therefore expect a package of services from the extension staff, which not only include measures to increase the efficiency and productivity of their crops but also provide (a) facilities for easy credit, (b) facilitate delivery of fertilizers and planting material, and (c) arrange an efficient system to market the goods at fair prices. Thus it can be concluded that the problems faced by farmers consists of a mix of issues embodying technical, social and economic contents of varying proportions, and for which a co-ordinated effort by many institutions, including the organized extension services, would be required.

Chapter 5

A CASE STUDY OF EXTENSION SERVICES IN THE MAHAWELI DEVELOPMENT AREA

5.1 THE MAHAWELI PROJECT

In 1972 as an outcome of an UNDP-FAO-Irrigation Department Master Plan, a massive development programme was initiated by the government to utilize the resource potential of the Mahaweli River to develop some dry zone districts in the North Central and Eastern Provinces of Sri Lanka. Under this Master Plan some 364,200 ha. (900,000 acres) of land consisting of 14 systems, were to be developed over a period of 30 years through the diversion of the waters of the Mahaweli River. Through its multipurpose headworks, the programme envisaged, (a) to bring into cultivation 99,000 ha of new land, (b) to enhance irrigation facilities for 75,000 ha of existing farm lands, (c) to produce 466 MW of electrical power to the national grid, and (d) to implement a major human resettlement activity in the project area.

By 1977, only a small component of the project could be completed, permitting the irrigation of 20,200 ha in the Kalawewa basin. Hence in 1977, the newly elected government decided to telescope the work schedules of the Mahaweli Development Programme, to complete the headworks within 6 years. This revised programme known as the "Accelerated Mahaweli Development Programme (AMDP)", was initially planned to be implemented by four organisations, The Central Engineering Consultancy Bureau (CECB), Irrigation Department, the Mahaweli Development Board (MDB) and the River Valleys Development Board (RVDP). This was in keeping with the strategies adopted for the early settlement projects, in which sectoral activities were implemented by the respective ministries and statutory bodies responsible for such items of work.

However, it was soon realized that a multipurpose programme of the magnitude of the Accelerated Mahaweli Development Programme could not be effectively implemented within the planned timeframe, unless headworks and downstream activities, including resettlement schemes, many of which run concurrently, could be co-ordinated by an apex organisation. In 1978, the organizational framework for the Programme was restructured creating the Mahaweli Authority of Sri Lanka (MASL). The MASL implements the programme with the assistance of three functionally specialised executing agencies. The Mahaweli Engineering and Construction Agency (MECA), The Mahaweli Economic Agency (MEA), and the more recently established Employment, Investment and Enterprise Development Division (EIED).

The MECA is the agency responsible for the first phase of development i.e., construction of headworks, and also the physical development of the new areas, downstream of the headworks. The MEA is responsible for the second phase of development, i.e., the economic development of the downstream areas. This includes settling of farmer families, ensuring that they are provided with basic social amenities, such as health, sanitary services and education, and providing the complete package of services required for agricultural production, such as credit supplies, water management and marketing. The EIED is responsible for the third phase of development, i.e., the creation of employment and business opportunities for the second and third generations of Mahaweli settlers.

5.2 THE ROLE OF THE MAHAWELI ECONOMIC AGENCY

All activities connected with agricultural extension and development in the Mahaweli project areas are taken care of by the Mahaweli Economic Agency. In order to carry out this function it has an organizational framework which is quite distinct from the administrative framework available for the other parts of the country. The MEA operates at four hierarchical levels, i.e., the headquarters, project, block and unit levels.

The chief executive of the Agency is the Managing Director assisted by the General Manager (cum additional Managing Director), and six managers responsible for land, agriculture, marketing, community development, water management and administration. Thus the core executive staff at the headquarters consist of the above staff plus the project co-ordinators for Mahaweli systems identified as H, B, C & G, and the special area of Uda Walawe.

At the head of the field operations is the 'project' office which covers a settlement area of about 10,000 to 15,000 settler families. This office is headed by the Resident Project Manager (RPM) who is functionally equivalent to an additional Government Agent. The RPM is assisted by six specialists in land, Agriculture, marketing, community development, water management and administration, and are designated as Deputy Resident Project Managers (DRPM).

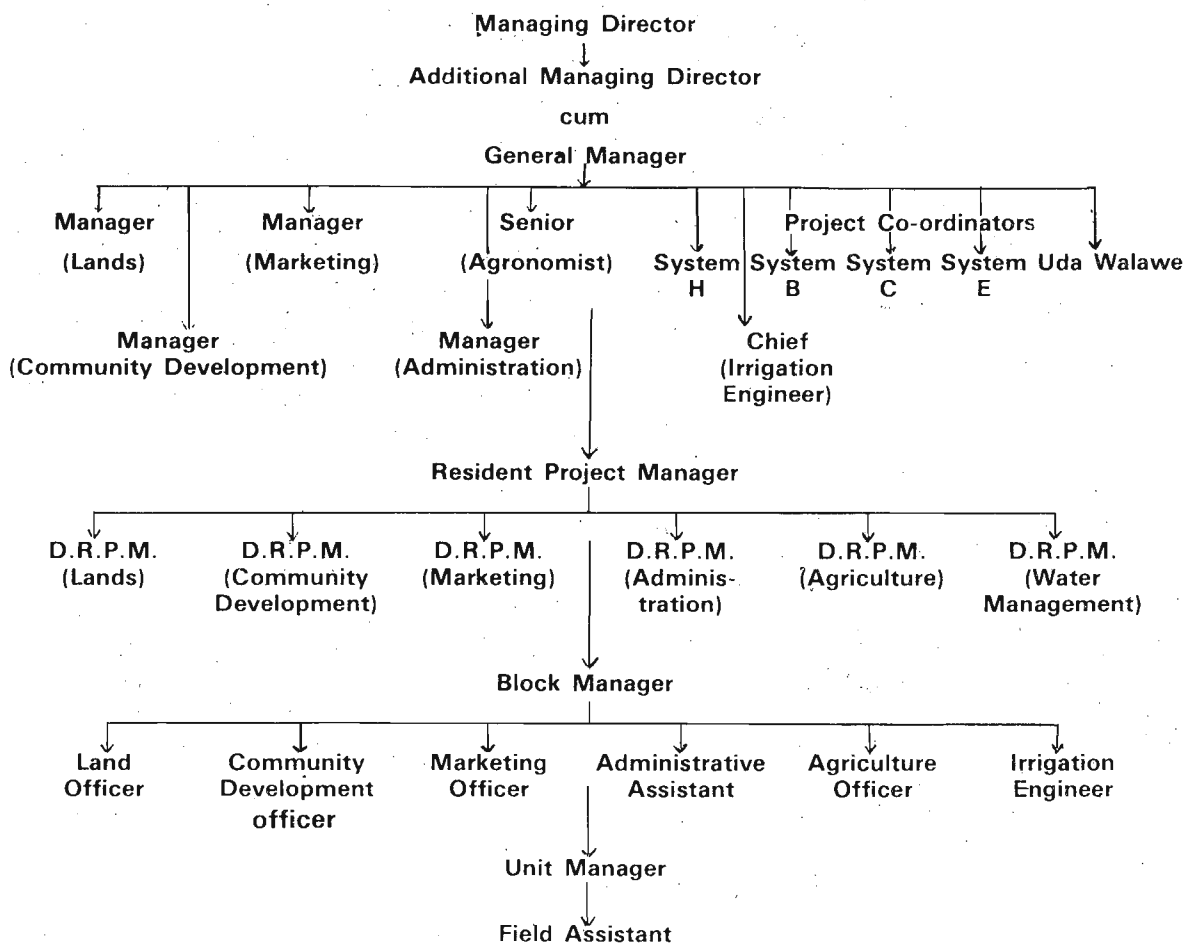
The next field operational level is the 'Block', which is responsible for a settlement area covering 2,000 to 3,000 settler families. The head of this division is the Block Manager (BM), who is functionally equivalent to an Assistant Government Agent. The BM is also assisted by six officers representing each of the discipline areas mentioned above.

At the ground level is the 'Unit', which is responsible for an area covering 200 to 300 settler families, and managed by a Unit Manager (UM). The UM is considered to be the chief Advisory Officer responsible for providing guidance and services for farmers on agricultural development, health and education. He is assisted by a field assistant who takes care of agricultural, extension activities at the grass root level.

The organizational framework of the Mahaweli Economic Agency is shown in figure II.

Figure II

ORGANIZATIONAL STRUCTURE OF MEA



5.3 AGRICULTURAL DEVELOPMENT IN THE MAHAWELI SYSTEMS

The Agriculture development programme drawn up for the Mahaweli systems H, C, B and the special area of Uda Walawe have been incorporated into the Agriculture Implementation Programme of the Ministry of Agricultural Development and Research. The recognition of the different systems of the Mahaweli as fully-fledged agricultural districts, has enabled the Ministry of Mahaweli Development and the MEA to co-ordinate, monitor, evaluate and integrate the agricultural activities of the AMDP with the National Agricultural Development Programme.

Tables 5.1, 5.2 and 5.3 below provide statistical information on the performance in paddy production in the Mahaweli area.

TABLE 5.1

PADDY PRODUCTION IN MAHAWELI PROJECT

Season	Total Mahaweli Paddy Production Including Walawe Project (M T)	National Production (M T)	Percentage of Mahaweli Production
1978/79 Maha	40,572	1,393,529	2.91
1979/80 "	57,976	1,483,830	3.98
1980/81 "	91,504	1,522,876	6.00
1981/82 "	82,759	1,363,243	6.07
1982/83 "	176,592	1,785,924	9.88
1983/84 "	163,957	1,353,354	12.10
1984/85 "	215,675	1,751,025	12.31
1985/86 "	236,888	1,688,138	14.03
1986/87 "	269,814	1,377,812	19.50

Sources: 1. Dept of Census and Statistics
2. Progress Reports of MEA

TABLE 5.2
AVERAGE PADDY YIELDS IN MAHAWELI AREAS (MT/HA)

Season	S y s t e m					National Average
	H	C	B	G	Uda Walawe	
1978/79 Maha	4.75	—	—	—	3.97	2.82
1979/80 "	4.52	—	—	—	4.32	2.95
1980/81 "	4.93	—	—	—	4.68	3.00
1981/82 "	3.70	—	—	—	4.88	3.15
1982/83 "	5.37	1.76	—	4.40	5.37	3.63
1983/84 "	4.19	1.81	5.20	3.25	4.16	3.03
1984/85 "	4.76	4.29	5.16	5.90	4.62	3.49
1985/86 "	4.79	4.29	8.41	5.66	5.09	3.58
1986/87 "	5.08	4.77	5.72	5.95	5.66	3.47

TABLE 5.3

**COMPARATIVE YIELD FIGURES FOR THE MAHAWELI SYSTEMS AND
THE CORRESPONDING NEIGHBOURING AGRICULTURAL DISTRICTS
AVERAGE YIELD OF PADDY PER ACRE — MAHA 86/87**

Agricultural District	District Average (in bushels)*	Corresponding Mahaweli System	Average Yield (in bushels)	Difference as % Dist. Ave.
Anuradhapura	79.60	H	102.25	28.5
Amparai	69.73	C	92.65	32.9
Polonnaruwa	96.62	B	109.52	13.4
Polonnaruwa	96.62	G	115.52	19.6
Hambantota	88.37	Uda Walawe Project	115.84	31.1
Mean	86.19	Mean	107.16	25.1

1 bushel of Paddy = 0.0209 Metric Tons

These statistics show that the Mahaweli Systems have contributed heavily to the national production and have exceeded the national production average of 3.47 metric tons per hectare. In fact as evident from Table 5.3, the Mahaweli Settlers have been able to produce 13-33 percent more per unit area than farmers in corresponding adjoining districts.

A substantial portion of this increase was achieved through direct yield increases, and these high yields have been possible due to many reasons. Firstly, Mahaweli farmers have adopted better varieties and cultural practices, and carry out timely field operations according to a scheduled calendar. Secondly, the operation of an efficient input supply system mainly through the network of private distributors, co-operatives and farmers shops assisted by field staff of the Mahaweli, has enabled the farmers to obtain inputs in time, and in required quantities at reasonable prices. Thirdly, the interest of the extension staff within each system at all levels, mainly in water management and agricultural extension has greatly assisted the farmers in achieving higher yields. These services have been improved through the experiences gained from past cultivation seasons. It has been observed that even under drought conditions, with careful irrigation and on-farm water management, the Mahaweli farmers have been able to get higher yields. In general a package deal comprising of advanced technology, knowhow, superior materials, timely inputs and co-ordinated supporting services, has resulted in a 25 per cent increase in yields in the Mahaweli Systems over the other agricultural districts, where such services are fragmented and somewhat dislocated.

5.4 AGRICULTURAL RESEARCH

The MEA funds the Department of Agriculture in the development and implementation of the research programmes of agricultural research stations situated in Mahaweli areas. These research stations carry out research activities based on the regional demands of the Mahaweli Development Programme. Table 5.4 summarizes the financial assistance provided by the MEA for scientific research.

TABLE 5.4

**BUDGET ALLOCATIONS FOR RESEARCH STATIONS SITUATED IN
MAHAWELI AREAS BY MEA**

Station	System	Budget allocations for 1985 (Rs. 000s)	
		Capital	Recurrent
Maha Illuppallama	H & G	83	2,831
Girandurukotte	C	2,000	2,155
Aralaganwila	C & B	7,790	3,008
Angunakolapelessa	Uda Walawe	299	1,081
Total		10,172	9,075

5.5 AGRICULTURAL EXTENSION ACTIVITIES

The agricultural extension strategy of the AMDP follows the pattern of the nation-wide National Agricultural Extension Programme of the Ministry of Agriculture. The Regional Technical Working Groups (RTWG) of the Mahaweli System comprises of representatives from the MEA and the Department of Agriculture, and operate for Systems H/G, B/C and Uda Walawe. As pointed out in Section 3.6, these Working Groups play an important role in identifying and allocating the priorities in research, education and extension requirements. They also set targets and work-norms for each system, depending on the prevailing conditions and environment.

The extension methodology practised by the Mahaweli Economic Agency is identical to the Training and Visit system (T & V) of the Department of Agriculture. In Mahaweli areas the field assistant (FA) takes the place of KVSN, as the village level extension worker, and he is responsible for providing agricultural extension services to the settlers in the "unit". According to this system every field assistant is provided in-service training once in two weeks, and he is expected to transfer the knowledge gained in such bi-weekly training to the settlers during the next fortnight. In his field visits an FA visits a number of "turn-outs" in a day depending on the size of the unit. (An area under one field channel is described as a "turn-out" (Awa Haravuma). If the FA wishes to convey any message to the other farmers, he does this through the turn-out leader (Awa Haravum Nayaka) — a progressive farmer appointed as the leader of the group of farmers in that 'turn-out'.

The FA also works according to a fortnightly schedule similar to that of the K.V.S.N. Present fortnight work schedule of an FA is as follows:—

Field visits	— 06 days
Bi-weekly training	— 01 days
Other duties	— 05 days
Holidays	— 02 days

During the field visits the FA observes farmer fields and provides advice in relation to problems. By this means any information on new innovations could also be communicated to the farmers. An important aspect of this mode of operation is that the FA can directly contact the Block Agricultural Officer, and seek advice on any problem

for which he has no answer, or in the alternative he could take up the subject at the fortnightly training class.

Bi-weekly training classes are conducted at the Block-Office by the Block Agricultural Officer, with the help of agricultural officers specialized in various disciplines in agriculture. In addition to this, pre-seasonal training classes are conducted by the In-service Training Institutes of the Department of Agriculture situated in Mahaweli Areas.

Thus, the major responsibilities of the agriculture section of the MEA are more or less similar to those of the extension division of the Department of Agriculture, except that MEA provides the entire range of supporting services to the settlers as well.

Major responsibilities of MEA's agriculture section are as follows:—

- i) Transfer of technology to farmers to increase production of paddy and other field crops.
- ii) Providing irrigation facilities to the farmers.
- iii) Training family units to improve level of living in rural families.
- iv) Feeding information from farmers to researchers.
- v) Conducting farmer level field trials.
- vi) Distribution of certified and requested seeds to farmers.
- vii) Supply of inputs like fertilizer and agro-chemicals supported with assistance to get credit facilities from banks.
- viii) Providing assistance to develop homesteads.
- ix) Collection of statistics of food crops.
- x) Helping farmers in marketing of their produce.

In addition to the above activities, the MEA conducts various farmer competitions and exhibitions to motivate the farmers towards intensive agriculture. One such popular contest is the 'Mahaweli Maha Goviya' Contest which is held annually by the MEA. In that competition they select the best farmers from each system, and offers awards and short visits to agricultural projects in neighbouring countries. These activities have also contributed to a certain extent, to operate the extension service successfully.

As had been pointed out earlier all field operations are carried out at the unit level. Hence the role of the Unit Manager (UM) is of considerable significance in the transfer process of knowhow. In the other agricultural districts of the country, the farmers are expected to visit a number of institutions to obtain the different services required for agricultural activities. But in the Mahaweli systems, the Unit Manager provides directly all the requirements and services, except any civil construction works. He provides technical advice, arranges credit from banks, supplies agricultural inputs, and releases irrigation waters. As a result of these functions, a close relationship is established between the farmer, unit manager and the field assistant. Thus it is evident that this type of management system has greatly facilitated the information dissemination and assimilation process at the operational field level.

However, on the other hand, certain unforeseen disadvantages had also crept into this system. Firstly, the work load of FAs' had increased considerably resulting in dissipation

of their time and effort in duties other than extension services. In fact, in certain units, the FAs' have not been able to keep to their weekly schedules of visits, meetings, and their own bi-monthly training schedules. Secondly, interference by politicians had also, in certain instances, diverted the attention of UMs' and FAs' from the pre-set work schedules and norms. The attention of the MEA authorities has recently been drawn to these inevitable drawbacks, which is now taking necessary steps to rectify these defects.

Chapter 6

A CASE STUDY OF THE IMPACT OF INTERNATIONAL SUPPORT TO AGRICULTURAL EXTENSION IN SRI LANKA.

6.1 INITIATIVES AND OBJECTIVES

In 1979, the Government of Sri Lanka requested the Food and Agriculture Organization (FAO) of the United Nations, to assist in promoting the efficient utilization of fertilizers and other inputs by small farmers on paddy, subsidiary food crops and coconut, to increase productivity and thereby enhance the family incomes. Accordingly in November 1980, a project titled "Yield Increase at Small Farmers' Level Through the use of Fertilizers and Related Inputs", was approved for implementation with financial assistance from the Government of Norway for its first phase of operation.

The project aimed to achieve the planned objectives by carrying out the following activities:

- (a) testing crop responses to fertilizers in small farms through the use of the most economic fertilizers, and increasing the knowhow on soil fertility and crop production,
- (b) demonstrating the benefits of correct application of recommended fertilizers on crop production,
- (c) training extension personnel and farmers in the use of fertilizers, related inputs and improved crop production techniques,
- (d) training senior agricultural staff in policy and practice in the use of fertilizers and related inputs,
- (e) improving distribution and marketing of agricultural inputs to ensure that farmers demands are met in time through better financing modes(3).

6.2 OPERATIONAL STRATEGIES

The main activities commenced in January 1981 after the appointment of a project co-ordinator, and consisted of several complementary field and laboratory operations, to meet the targets determined by a multiplicity of project objectives. Considering the small core staff available for full time work on the project, many of the activities were scaled

down to manageable levels. These activities in general consisted of trials and block demonstrations in respect of paddy and subsidiary food crops, and fertilizer demonstrations in respect of coconut.

The 'trials' consisted of unreplicated 9-plot treatments for three levels each of nitrogen, phosphorous and potassium, conducted on some 4,800 trials for rice, maize, soyabean, green gram, black gram, cowpea, groundnut, chillies, onions, tomato, beans and potato. The main objectives of these trials were to evaluate the economic optimum fertilizer requirements of the above crops under the major soil types of the country. In addition to the above trials some 500 special trials were also conducted to investigate specific problems related to fertilizer use, identified during the course of the project. There were also some 6,000 simple demonstrations of recommended fertilizer rates using 4-plot (nil, N, NP, NPK) verification trials(3).

The 'block' demonstration concept introduced in 1983, consisted of an approach in which small groups of farmers were provided with facilities for crop intensification through the provision of rural credit to buy crop production inputs, and enabling the establishment of a capital fund to ensure economic stability. In this scheme groups of farmers not exceeding 25 in number, and covering a cultivated land area of about 2.5 ha were selected on the basis of some pre-existing community interest such as, proximity of land holdings or common use of water supplies(3).

Financed by the project some 62 block demonstrations, covering a membership of over 1000 farmers and a cropped area of over 500 ha, were established and operated with nearly 1.4 million rupees in soft loans. It was observed that within a relatively short period of about 2 years, a high proportion of groups had repaid more than 100 per cent of their loans, and were establishing group funds for future activities.

In respect of coconut, the only perennial crop under this major agricultural extension programme, some 213 sites were selected in 1980, covering most of the coconut growing agro-ecological systems in the country. At each site was a simple fertilizer demonstration consisting of 3 plots of 10 coconut palms each.

The three treatments were meant to demonstrate the effects of (a) absence of fertilizers, (b) the application of the full complement of fertilizer and (c) the use of fertilizers together with a leguminous cover crop. However, due to various constraints, only the treatments (a) and (b) were established in all sites, and by October 1987, only 113 demonstrations remained operational.

The project for the fertilizer demonstrations on coconut completed its first phase during 1987, and before embarking on a second phase, it was considered necessary to carry out an independent investigation to evaluate: firstly, the performance of the on-gong site demonstrations and select around 50 for continuation of the programme; secondly, to study the responses of coconut to the fertilizer treatments using yield, and soil and leaf analytical data; thirdly to study possibilities of intercropping with a view to demonstrating its potential for increasing family incomes; and fourthly to identify constraints in operating this programme. This evaluation was carried out as a special assignment by one of the researchers of the current study, who took this opportunity to get first hand information on the problems of knowledge transfer at the ground level(3). The case study is thus limited to the fertilizer demonstrations on coconut, and is based on the special observations made by the researcher during field investigations, which now forms a useful complementary contribution to the present study.

6.3 FERTILIZER DEMONSTRATIONS ON COCONUT

The project "Yield Increase at Small Farmers Level Through the Use of Fertilizers and Related Inputs", as indicated earlier, had many different objectives all directed towards assisting the small farmers to increase family income, and thereby raising the living standards of rural communities. In the case of paddy and subsidiary food crops, all of which are annuals, several complementary projects were initiated simultaneously, whereas with coconut it was feasible only to operate a single major project, and that was fertilizer demonstrations under different agro-ecological conditions. There was also another concern in the case of coconut. At the prevailing costs of agricultural inputs, especially fertilizers, and prices of primary products, the Value to Cost Ratio (VCR) was at the discouraging level of about 2, whereas for other food crops it was about 4. Hence even with prospects for substantial yield increases with fertilizers, it would need sustained effort to induce farmers to fertilize coconut palms, unless some significant market changes occurred. A perennial like coconut also reacts adversely to moisture stress during prolonged droughts — which is now a regular phenomenon in the country's weather cycles. It is against the background of these uncertainty factors that a demonstration exercise on coconut had to be initiated.

Unlike in the case of field demonstrations conducted by research organizations, fertilizer demonstrations in this particular programme was to be carried out directly in farmers fields with the close participation of the farmer and his family with the extension personnel. The project was executed jointly by the Coconut Cultivation Board (CCB) and the Coconut Research Institute (CRI). Each farmer was provided the necessary fertilizer, which was applied under the guidance of the Coconut Development Officers of the CCB, according to the recommended rates and methods of application. The cost of fertilizer was borne by the project, while costs of application were met by the farmers. At the time of the bi-monthly picks the Coconut Development Officers supervised the recording of the yields. In addition to these routine activities soil and Plant samples were taken by the officers of the CRI at specified intervals for laboratory studies.

Although there were occasional technical problems of co-ordination, the work was carried out reasonably well during the first 2-3 years of the first phase. The farmers involved had every reason to be pleased with the project, since they received the inputs and technical advice free of charge, and their plantations were being closely observed and monitored, both by extension officers and scientific personnel. However, unfortunately a prolonged drought during 1985-1986 resulted in a drastic drop in yields, and to the dismay of farmers the worst affected appeared to be the healthier and fertilized plants. As a result of this disastrous drought, the yields as well as the chemical data on soils and leaves of coconut became erratic and distorted. Thus just at the time when the real benefits of fertilizers could be demonstrated convincingly to the small farmers, the project suffered a major set back.

6.4 FARMERS REACTIONS TO FIELD DEMONSTRATION PROJECT

Out of 111 sites in operation at the end of 1987 only 99 could be visited as the remaining 12 sites, situated in the Northern and Eastern Provinces were not accessible during the period of the study. The district-wise distribution of these sites was as follows :—

Anuradhapura	district	—	4 sites
Puttalam	district	—	7 sites

Kurunegala	district	—	41 sites
Gampaha	district	—	15 sites
Kegalle	district	—	6 sites
Kalutara	district	—	5 sites
Galle	district	—	6 sites
Matara	district	—	6 sites
Hambantota	district	—	9 sites

Each site inspection involved (a) a visual count and an estimation of the next harvest of nuts, (b) a close study and review of the demonstration plots on selected criteria of suitability, and (c) an interview with the farmer on aspects of the field operation, the constraints, and more important, the extent to which the project had helped to promote the cause of fertilizer usage. In some sites visited, the farmer did not reside within the site. However, in such instances action was taken to meet the farmers by prior appointment. These discussions with the owners or farmers were important, as they were the extension intermediaries who should carry the message of fertilizer usage and its benefits to his fellow farmers. Table 6.1 summarizes the responses of farmers to some of the key issues taken up at the interviews.

One of the desirable aspects of a demonstration experiment established for the purpose of information dissemination is the location and layout of site. It was reported that 94 out of 99 sites were accessible, and 77 out of 99 were visible from the approach road. However, only 21 sites were close to places where people gather (e.g. temples, churches, schools, rural development societies, Assistant Government Agents offices, agricultural service centres), etc.(2).

TABLE 6.1

SUMMARY OF FARMERS RESPONSE TO KEY ISSUES INVOLVED IN THE FERTILIZER DEMONSTRATION PROJECT

	Anuradhapura	Puttalam	Kurunegala	Gampaha	Kegalle	Kalutara	Galle	Matara	Hambantota	Total	Percentage
District-wise distribution of demonstration sites	4	7	41	15	6	5	6	6	9	99	100
No. of farmers available on site	3	6	18	11	4	4	5	4	7	62	62.6
No. of farmers extending co-operation to project	3	5	32	7	3	2	1	4	5	67	67.7
No. of farmers aware of project objectives	3	6	19	7	3	1	1	2	7	40	40.4
No. of farmers who have received inquiries and provided advice	3	5	15	5	3	1	1	2	4	39	39.4

A second factor that has to be considered is the need to have a knowledgeable person within, or in close proximity to the demonstration site to disseminate information. In the present case it is the owner, caretaker or the farmer himself who should be involved, and who should, in the first place, be convinced of the results. The study showed that while in 62 out of 99 sites some representative was available on site, only around 40 percent of them were familiar with the basic objectives of the demonstration experiment. It was also unfortunate that about a third of the farmers/owners, had lost interest in the project and were not extending their co-operation to the project. This was particularly obvious in the districts of Galle and Kalutara, where it was claimed that owners of coconut land were not particularly dependent on income from land, as they had other sources of income, and land ownership was only of prestige value. But a more serious cause appeared to be the lack of confidence in advisory officers, some at least of whom, could not match the experience, ingenuity and competence of the growers themselves. In contrast, many of the discontented farmers appeared to appreciate and respect the research personnel who visited these sites annually to collect soil and plant material for laboratory studies (although many of them preferred to be informed of the results of these chemical studies). It seems plausible to conclude that disengagement of scientific research from extension, coupled with excessive non-extension activities, may have affected the quality of service among advisory personnel in the coconut industry.

The third factor is the motivation for dissemination of new information by the owners or farmers, privileged to participate in the demonstration experiment. The study showed that only around 39 percent of the participants received any inquiries from the public, and hence be able to contribute directly to the main objectives of the project. Many reasons have been adduced to the relatively low output; some of which already referred to earlier, include inaccessibility and visibility of sites, remoteness of sites to places where people gather, absence of the farmer/owner on site, age and irregular nature of plantation, ignorance of the basic objectives of the project, and the lack of responsiveness of some farmers. There were also many unforeseen constraints, such as an unprecedented drought during 1985-1986, land disputes and partitioning of land on which demonstration trials were established, death of the owner or farmer, inability of relevant authorities to arrange for the delivery of inputs in time, waning interest of farmers directly involved in the project and their failure to motivate and co-opt the near family members to participate actively in the demonstration trials etc.

Nevertheless it is significant to note that there were at least 3 very observant farmers who made an impact on the program. Their observations on the increased weight of the nut, as opposed to the total number of nuts, through fertilizer usage needs special mention: and since this response occurred regardless of the drought, these farmers gained new confidence in fertilizers and even passed on the message to fellow farmers.

In concluding this chapter it may be mentioned that while field demonstrations in farmers fields is a practical and 'down to earth' approach for diffusion of knowhow, there are many vital issues that should be considered in organizing such an exercise, and the lessons learnt from this project funded by FAO, should be of considerable value in planning any new national program on information dissemination through field demonstrations.

Chapter 7

SUMMARY AND CONCLUSIONS

Science and technology indicators when developed in the appropriate perspective can be used as forceful decision making tools through the messages they convey on the effectiveness of applied scientific interventions. Third world countries have rarely considered the opportunities offered by such indicators in national development planning. In fact while many of the industrialized countries are continuously refining and evolving science and technology indicators, developing countries seem to be contented in debating the niceties of such indicators.

Science statistics and indicators are produced by a number of international agencies mainly to assist countries and specialized organizations with inter-country comparative data. However, the emphasis in these data are the qualitative aspects of resources devoted to science and technology, and hence concerned only with the supply side of S and T.

The present study is an initiative towards building a new vision on demand-oriented indicators for science and technology, with the expectation that the attention of both socio-economic planners and science policy makers will be drawn towards integration of S and T in national planning. Primarily it attempts to identify the factors which promote or retard an effective information transfer system linking scientific research with users of new agri-technology in increasing productivity. Hence its scope covers the following major aspects:

- (i) Organization of extension services
- (ii) Functions and operations of extension services
- (iii) Performance and linkage among extension personnel, researchers and end users
- (iv) Delivery, receptivity and effectiveness of extension messages

It is known that the Department of Agriculture which is the biggest performer of research, devotes around 70 per cent of its annual budget for extension, training and research. Although the other research organizations disburse proportionately less of their annual budgets on extension services, it is deduced that in the absence of an organized intelligence system for retrieval and upstream transfer of need-based information, a fair proportion of scarce resources have been dissipated without tangible results.

The present study was conducted in the two major agro-climatic areas represented by Kamburupitiya in the Matara District (low-country intermediate zone) and by Peradeniya in the Kandy District (mid-country wet zone), which are dominated by mono-crops such as rice, rubber, coconut, and tea, combined sometimes with some inter-crops. The majority of farmers are small holders with average holdings of less than 2 hectares. The two districts are graced by the presence of the agriculture faculties of the Ruhuna and Peradeniya Universities, which have the potential for technical back-stopping of research as well as extension programmes in the field of agriculture.

The main survey was supplemented with two case studies, one of which was related to the special conditions of the re-settlement schemes of the Mahaweli River Diversion and Development Programme, and the other built around an FAO — funded project on fertilizer demonstrations.

Although an elaborate extension facility is available in the agriculture sector of Sri Lanka, the findings of this survey indicates a fragmentary trend in the information transfer mechanism, resulting possibly from some inadequacies of the agricultural development policies in the country. Thus for example, the claim made out by a majority of the extension personnel, that where farmers are dependent on government subsidies, the motive force for acceptance of recommendations seems to be such assistance, is a poor reflection of the need-realization in agri-technology. On the other hand, where subsidy was not a significant issue, the decisive factor for use of agricultural inputs was the brand name and popularity of the product.

The extension system as well as the research network have only marginally attempted to be associated with traditional practices and time-tested concepts of farming. Current evidence shows that many farmers are not prepared to sit back and accept any changes without proof of reliability. At the same time, farmers did not passively await for their information needs to filter through formal channels.

Although a majority of the extension personnel believed that about a third of the farmers were quite conservative and hesitant to change, direct inquiries revealed that only about 15 per cent were dependent on traditional methods. Any reluctance to accept untested and unfamiliar practices were largely related to their contentment with methods generated from what may be called 'Action Experience'. That is, the experience and methodologies refined through generations of active participation in agricultural production.

Although the Training and Visit System has been employed by some extension organizations with limited success, it is clear that the failure to understand and exploit the in-built social intelligence network of rural societies has been a drawback. It is known that farmers frequently become aware of new developments in the market place and the weekly fair which are the village institutions facilitating trading of goods and services, as well as exchanging of news and views.

On the other hand, technologies and practices which had a demonstrable effect on increasing the value to cost ratio (VCR) in crop husbandry, appealed to farmers. This has been truthfully reflected by the increased use of new planting materials and advanced techniques which promotes cost effective productivity increases, and which therefore provide some index of the efficiency of the information transfer mechanism in vogue. Thus the area under improved varieties of paddy had increased from 70.7 per cent in 1970 to 99.7 per cent in 1987. As a consequence, the average yield of paddy had increased from 125.7 bushels per hectare in 1970 to 172.2 bushels per hectare in 1987. However, the phenomenal increase in fertilizer usage from 85,000 tonnes in 1970 to 232,000 tonnes in 1980, could be partly due to production incentives such as subsidies.

It is to be noted that only 15 per cent of the E.O.'s thought that faith in science was the reason for acceptance of their advice, while 45 per cent agreed that a combination of factors including faith in science, was the impetus to accept official recommendations.

In fact a major deficiency of the extension service organization has been its thrust towards, a supply-push service, which lacked focus on the information needs of farmers. Hence with time, the farmers seem to have attuned themselves to such an orientation and drifted away from the technology-push scenario in seeking and imbibing new knowledge. Nevertheless it is noteworthy that the technology embodied high yielding planting materials for grains, legumes and spices produced by Sri Lankan breeders during the past two

decades, had been almost a universal success, both in terms of transfer of knowhow and in their widespread acceptance. This example clearly demonstrates that once convinced, farmers make no pretence of their choice of technologies.

However, agri-technology has to be low-cost to be of any use with rural farming. A recently developed paddy harvester priced at around Rs. 15,000/- had helped to reduce the harvesting cost by reducing the manual labour requirement by 140 man-hours per ha. However, with the majority of farmers owning less than 1 ha per person, it is considered unlikely that a spontaneous change to technology-intensive farming could take place at the small farmer level unless some state intervention is forthcoming to share the burden of capital costs. Thus the weak resource base of the majority of farmers is therefore a matter to be considered by extension organizations in promoting advanced techniques of agriculture to rural farming systems.

The organization of agricultural extension services, suffers from linkage problems. While there is some concern about the interactions between the extension personnel and farmers, there is also an equally serious linkage problem between researchers and extension personnel. While 80 per cent of the extension personnel claimed that they followed strictly the advice of scientists, others felt that the communications they received from researchers lacked clarity. But the more striking revelation was the claim by 8 out of 10 extension officers, that impracticability and non-relevance to field problems were the major reasons for farmers reluctance to accept advice offered by researchers. At the same time around 50 per cent of the E.O.'s have stated that they have no problem in communicating the field problems to researchers.

One of the major drawbacks noted in some cases (eg. coconut and rubber) was the total administrative de-linking of the extension facility from the researchers. The result of such ill-conceived political decisions has been a significant dislocation in the information transfer chain.

The extension officers (mainly agricultural instructors, coconut development officers and rubber instructors) devote a significant proportion of their time (25 per cent or more) on non-extension activities such as processing of applications and distribution of subsidies. A few at least of these personnel appear to enjoy this activity rather than extension work.

Although at the ground level, the ratio of village extension workers (ie. KVSN's) to farmer families was projected at an optimal of between 1:700 to 1:800, in practice due to various reasons, the Department of Agriculture had to be contented with ratios ranging from 1:1000 to 1:1500. It is thus significant that around 37 per cent of the farmers surveyed, claimed that they had not received any assistance from village extension workers.

Many of the field extension personnel lacked sufficient experience to cope up with tasks assigned to them. Only 22 percent had more than 5 years of experience in field operations, while 42 per cent said that they had only 2 years of work experience. Most farmers being persons with decades of hands-on experience, rightly see the extension personnel as amateurs, and are hence inclined to ignore their advice. Thus in the eyes of the E.O's themselves about 25 per cent of farmers tend to disregard their advice.

Apart from the dynamic role to be played by the extension personnel, innovative methods for information transfer needs to be tested and evolved regularly. Such has been the case in the new settlements of the Mahaweli River Diversion Programme. Thus a package deal comprising of advanced technology and knowhow, superior methods, timely supply of inputs, and a co-ordinated supporting service was shown to produce a 25 per cent increase in yields in the Mahaweli Systems, over that of other agricultural districts of the immediate neighbourhood where such services were fragmented. In fact with these facilities the Mahaweli settlers have been able to exceed the national paddy production average of 3.47 metric tonnes per hectare.

Similarly, the 'block demonstration' concept introduced in the FAO-funded extension programme to promote yield increases among small groups of farmers, through the provision of a package of facilities including credit, has shown that within a relatively short period of about 2 years, a high proportion of farmer teams had repaid their loans and were building up a working capital. This same programme also showed that while field demonstrations in farmer fields is a practical and 'down to earth' approach in agricultural extension, vital issues such as location of sites, layout of the fields, leadership quality of the selected farmer, responsiveness and ready availability on site of participant (farmer) to disseminate relevant information and good management are critical factors for success. Thus in the fertilizer demonstration exercise sponsored by the FAO on coconut, only 39 out of 99 participating farmers received inquiries about fertilizer usage from the public. The low impact of the project was due to several reasons, of which the most serious was the fact that with time, the participating farmers began to lose sight of the original concepts and objectives of the programme, partly due to the waning interest in its activities.

In general it may be concluded that the study on dissemination and assimilation of scientific knowhow in agriculture has helped to spotlight several shortcomings in the current methods of information transfer. However, in the process, it has also been possible to identify at least two cases of success stories which deserve consideration by the authorities concerned. First of these refer to the success of the extension package offered to farmer families in the new settlements of the Mahaweli Project, which had resulted in substantial increases in yield through good management and timely application of agricultural inputs. The second concerns the success of team effort of farmers in the so-called block demonstration trials, in which again an extension package combining a soft line of credit was found to catalyse motivated farmer groups to work towards early debt clearance, followed by generation of a working capital for future activity.

REFERENCES

1. Census and Statistics Department (1987). *Statistical Pocket Book*, Department of Census and Statistics, Ministry of Plan Implementation, Colombo, Sri Lanka.
2. De Silva, M.A.T. (1988). A Field Evaluation of Fertilizer Demonstrations on Coconut, *Fertilizer Project Phase II — Yield Increase at Small Farmers Level Through the Use of Fertilizers and Related Inputs*. Field Document No. 2 GCPF/SRL/047/NET-CRI-CRB-FAO, Peradeniya, Sri Lanka.
3. Food and Agriculture Organisation (1986). *Yield Increase at Small Farmers' Level Through the Use of Fertilizers and Related Inputs — Sri Lanka*. Project Findings and Recommendations — Terminal Report AG:GCPF/SRL/034/NOR. FAO. Rome.
4. Harmik, R.C. (1982). *Communications in Agriculture*, Stanford CA, Stanford Univ. and Univ. of Pennsylvania.
5. ISNAR Report (1984). *The Agricultural Research System in Sri Lanka*. Joint Review Group, International Service for National Agricultural Research. The Hague, Netherlands.
6. Liyanage, S. and De Silva, M.A.T. (1987). *Sri Lanka Science and Technology indicators. Part 1: Organisational Structures and State of S & T Activities*. Natural Resources Energy and Science Authority of Sri Lanka, Colombo, Sri Lanka.
7. Ministry of Finance and Planning (1986). *National Agricultural Research Plan*. Agricultural Research Group, National Planning Division, Ministry of Finance and Planning, Colombo, Sri Lanka.
8. Ministry of Finance and Planning (1987). *Public Investment 1987 - 1991*. National Planning Division, Ministry of Finance and Planning, Colombo, Sri Lanka.
9. Ministry of Finance and Planning (1988) *Public Investment 1988 - 1992*. National Planning Division, Ministry of Finance and Planning, Colombo, Sri Lanka.
10. Morton, J.A. (1986). The Innovation of Innovations. *IEEE Transactions on Engineering Management*. Vol. EM - 15(2), pp 51-65.
11. Sivayoganathan, C. (1985). Training and Visit System in Sri Lanka : *Relative Importance of Contact Farmers as a Source of Rice Production Information, Agricultural Administration*. Vol. 18(3) pp 127 - 135.
12. Winrock International (1987). *Agricultural Development Indicators* 4th Edition Winrock International Institute for Agricultural Development, Morrilton.