

# *Appendix B*

## *Agriculture*

## APPENDIX B AGRICULTURE

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## APPENDIX B      AGRICULTURE

### Chapter 1      NATIONAL AND REGIONAL BACKGROUND

#### 1.1      Agricultural Policy and Legislation

##### 1.1.1      Government Policy

Sri Lanka did not have a consistent long term national policy on agriculture and agricultural development since independence. However, successive governments have launched several programs and projects that were implemented through different administrative mechanisms for development of the agricultural sector in the country.. Some of the important programs and project that had an impact on the agricultural development in the past are listed below.

- 1) Agriculture Plan of 1958
- 2) Accelerated Food Production Program of 1963
- 3) Agricultural Development Proposals of 1965 and Five Year Programs (1966 – 70)
- 4) Five Year Plan of 1971
- 5) Accelerated Mahaweli Development Program of 1978
- 6) Irrigation Program Review of 1966 – 1986
- 7) Integrated Management of Agricultural Settlements (INMAS) of 1984
- 8) Policy on Participatory Irrigation Management of 1989
- 9) Shared Control of Natural Resources (SCOR) of 1994
- 10) National Policy Framework (the New Approach) of 1999
- 11) Six Year Development Program of 1999 – 2004

The Six Year Program emphasized private sector participation/partnership for commercial seed production, small scale agro-processing/value addition and identify causes for yield stagnation and develop strategies to overcome this condition.

- 12) National Policy on Agriculture and Livestock: 2003 – 2010.

In the development of agriculture sector the specific growth expectations are identified in this policy document as follows.

- (a) Increasing productivity of agriculture and livestock production
- (b) Minimize outflow of foreign exchange for food imports
- (c) Removal of dependency mentality which has plagued the entire agriculture and livestock industry
- (d) Bring in the capital, management, and technological skills and resources present in the medium and large scale private sector production sphere, into agriculture
- (e) Maintain the annual growth rate of the agriculture and livestock sector at around six percent

The Policy is to mobilize state and private sector investments and human resources on planned action to transform domestic agriculture and livestock industry to a

sustainable strong economic force for the development of the country supplying the consumer needs from the output of the farming community and the agricultural and livestock production process. This broad policy directs the accomplishment of the following policy goals.

- (a) Prosperity to the farming community by increased income
- (b) Food security of the people
- (c) Surplus production increasing agricultural incomes while supporting investments in other sectors
- (d) Increased export incomes from crops and products of export potential
- (e) Profitable and sustainable income earning from ventures from agricultural crops and livestock production promoted with tariff and rebates, where necessary, in the short run and with support of technology and management to complete in the market in the long run.

Policy statements on 18 sub-sectors are presented with policy goals/objectives and indicators of progress. Of particular interest and relevant to the current study are the sub-sectors on paddy production and on seeds and planting materials. The national agricultural policy in respect of paddy production is mobilize resources for self sufficiency within three years in rice, which is the staple food of the people, produce rice varieties for which foreign demand exists, and to produce a surplus to be utilized in an expanded value added rice based food industry.

The national policy on seeds and planting material production provides for increased private sector involvement in the seed sector and encouragement of selected farmers and agrarian service center level for seed production. This policy objective is based on the new seed policy contained in the document 'Policy of the Government of Sri Lanka on Seed and Planting Material Industry' published by the Ministry of Agriculture, Lands and Forestry in March, 1997. The policy has remained virtually unchanged to-date though modifications and replacements have been considered over the years by consecutive governments and by Cabinet Ministers. The main policy components can be considered under government activities and private sector activities. The government activities, implemented by the DOA, consist of 1) developing and releasing varieties, 2) provision of basic seeds and planting material, and 3) seed certification and quality promotion. The private sector activities involve 1) commercial seed production, processing, marketing and utilization, and 2) importation of quality seed and planting material. It is clearly stated that 'the government will not compete with the private sector in commercial seed production' and the policy was activated from 2002 Yala season onwards. Basic and certified seed paddy production is shown in Tables below.

**Table B 1.1.1 Basic Seed Production in Government Farms**

(Unit: ton)

Year	Foundation	Registered	Total
2001	170	1720	1890
2002	117	1548	1665
2003	158	1607	1765
2004	149	1789	1939

Source: Administration Reports, DOA (2001 – 2004)

**Table B 1.1.2 Certified Seed Paddy Production by Public and Private Sectors**

(Unit: ton)

Institute	2001	2002	2003	2004
DOA	1,918	790	--	--
Provincial & Inter-provincial councils	1,307	2,908	2,717	3,158
Mahaweli Authority	1,071	647	1,430	828
Co-operatives	1,950	2,041	2,142	1,559
ASCs/FOs/Individual farmers	3,084	5,040	4,952	5,272
Private Companies	2,026	1,636	3,903	3,268
Total	11,356	13,062	15,147	14,086

Source: Administration Reports, DOA (2001 – 2004)

### 1.1.2 Legislature

There are several government Acts relating to lands, agriculture and irrigation. The relevant ones are listed below.

- 1) Agricultural Land Act No. 42 of 1973
- 2) Agricultural Productivity Act No. 2 of 1972
- 3) Animals Act No. 29 of 1958
- 4) Cooperative Act No. 5 of 1972
- 5) State Lands Ordinance
- 6) Flora and Fauna Ordinance
- 7) Flood Control Ordinance
- 8) Forest Ordinance
- 9) Irrigation Ordinance
- 10) Land Development Ordinance
- 11) Mahaweli Development Act No. 14 of 1970
- 12) Sale of State Lands (Special Provision) Act No. 43 of 1973
- 13) State Lands (Possessions) Act No. 7 of 1979
- 14) Water Resources Board Act No. 29 of 1964
- 15) Wells and Water holes Ordinance
- 16) Agrarian Development Act No. 46 of 2000
- 17) Plant Protection Act of 1980

Of the legislature, the Agrarian Development Act No. 46 of 2000 is of particular interest as it promulgates under section 30, that every paddy land which can be cultivated with paddy shall be utilized for cultivation of paddy. However, provision exists for cultivation of half yearly or long term crops other than paddy after obtaining written permission of the



Commissioner General of Agrarian Development, subject to provisions of sub-section 29 (5). The Commissioner General shall identify paddy lands from which sufficient production can be obtained when cultivated with other agricultural crops. For this purpose, the Commissioner General shall obtain observations of the Farmer Organizations and Agrarian Development Councils, and appoint Productivity Committees for assisting in the identification of lands. Upon identification of paddy lands from which sufficient production can be obtained by cultivating other agricultural crops, the Commissioner General may by a notification published in the Gazette declare that provisions of sub-sections (1) and (2) of section 6 shall cease to apply to such paddy lands.

This legislature imposes some restriction on ad-hoc attempt at crop diversification in the paddy lands, particularly those identified as high potential irrigated paddy lands located in the declared granary area.

## **1.2 Brief History of Extension in Sri Lanka**

### **1.2.1 Early Period**

Agricultural extension service in Sri Lanka evolved over time from the late 19<sup>th</sup> Century. From about 1880, Agricultural Instructors (AIs) were appointed to work directly under Government Agents of the provinces, with whom the responsibility of agricultural extension was vested. However, development of peasant agriculture received scant attention at this time. In 1904, the Ceylon Agricultural Society was established which undertook extension work in association with the GAs. To resuscitate agriculture in the peasant sector, the Department of Agriculture (DOA) was established in 1912, and in 1919, Agricultural Divisions were created with Agricultural officers (AOs) and Agricultural Instructors appointed to work at division and range levels, respectively. The three Agricultural Divisions established at the beginning increased gradually to nine to cover nine provinces by 1957. However, the emphasis on research and advisory work still continued to be directed to the plantation sector. It was only after gaining independence in 1948, that the government started to play a major role in developing the peasant sector. This was necessitated by the rapidly increasing demand for food supplies, for which the existing colonization schemes were expanded and new schemes implemented. Since the DOA was not equipped to meet the new extension needs, a Department of Food Production (DOFP) was set up in 1952, under the Ministry of Agriculture. The DOFP functioned for a brief period and about 500 Food Production Overseers, recruited by this department, were absorbed to the DOA as Krushi Vyapathi Sevaka (KVS) to work as field level extension workers under the AIs. In 1957, the DAO grade was abolished and replaced by District Agricultural Extension Officer (DAEO).

The extension service of DOA was re-organized and strengthened in 1964 as a separate division under a Deputy Director of Agriculture (Extension) with a wider scope and greater responsibilities. By 1979, the Extension Division of the DOA was further consolidated into a more effective organization to meet some of the needs that became apparent by that time.

Thus, each DAEO was assisted by segment Agricultural Officers who had an extension staff of AIs at the range level. The district team was supported by a set of specialized Subject Matter Officers (SMOs) for programming, training and technical backstopping. AIs placed at divisional level supervised a team of KVSs working at village level covering 1000 – 1500 farm families. In the 1960s, Agricultural Extension Centers were established in each of the AI ranges to provide farmers with advisory and other services and was further strengthened in the 1970s, by combining the services of different agencies under one roof. These centers presently named as Agrarian Service Centers (ASCs) and operated by the Department of Agrarian Development (DAD) housed all agencies that provided services to farmers including Agrarian Productivity Committee, Agrarian Services Department, bank, Coconut Development Board, Cashew Corporation, Department of Animal Production and Health and the AIs of DOA. Even though the extension services achieved notable success in increasing the agricultural production during this period there were many inadequacies and weaknesses in the system. The heavy workload, diversity of the subject matter, large area of coverage and mobility were some of problems identified in the extension system.

In the beginning, the DOA was responsible for extension of all crops, both in plantation and the peasant sectors as well as livestock development. As the activities of the DOA expanded over the years, some of the extension functions were gradually handed over to separate government agencies that were established from time to time. These agencies are listed below.

**Table B 1.2.1 Agricultural Extension Agencies**

Subject	Institution	Year of Establishment
Tea	Tea Research Institute	1925 (under Planters Association of Ceylon)
	Tea Research Institute	1957 (as a government institution)
	Tea Small Holdings Development Authority	1976 (for small holdings less than 20 ha)
Rubber	Rubber Research Scheme	1913
	Rubber Research Scheme	1934 (shifted to present location)
	Rubber Research Institute	1951 (for plantations of over 40 ha in extent)
	Rubber Development Department	1994 (for small holdings)
Export Crops	Department of Export Agriculture	1972 (as Dept. of Minor Export Crops)
Livestock	Department of Animal Production and Health	1978 (separated from DOA)
	Provincial Department of Animal Production and Health	1989 (extension function devolved to the provincial council)
Coconut	Coconut Research Scheme	1929
	Coconut Research Institute	1950 (for plantations of over 20 ha in extent)
	Coconut Research Board	1972
	Coconut Cultivation Board	1972 (for small holdings)
Cashew	Sri Lanka Cashew Corporation	1973
Sugarcane	Sri Lanka Sugar Corporation	1957
	Sugarcane Research Institute	1981

### 1.2.2 Agricultural Extension and Adaptive Research Project

Under the World Bank funded Agricultural Extension and Adaptive Research Project (AEARP), implemented between 1979 – 1986, extension functions of the DOA underwent significant expansion. The T&V system adapted was instrumental in establishing research extension linkages, systematic scheduling of farm visits by the extension workers,

preparation of seasonal extension program along with monitoring and training of the staff. The project helped to strengthen the infrastructure facilities, staff mobility, program funds and staff development at all levels. The main features of AEARP were 1) a professional unified extension service covering all crops with a command line from Deputy Director (Extension) to village level extension worker (KVS), 2) provision for regular fortnightly training of AIs and KVSs by SMOs in crop, stock or other disciplines, and 3) programmed visits to groups of farmers by KVSs once a fortnight with relevant information on topics of interest and importance. For implementation of the project, following methodology was adapted

1. Eight Regional Technical Working Groups (RTWGs) were established representing each of the agro-ecological zones of the country. Extension programs of the districts were prepared based on the priorities decided at the RTWG meetings, held prior to commencement of each season. The Group composed of technical staff of the research, extension, education, and farm divisions working in the region.
2. As decided at the RTWG meetings, pre-seasonal training programs for SMOs, AIs and KVSs were conducted at the Regional Training Centers on relevant subject areas. Resource persons for the training programs consisted of Researchers from the Research Centers, Subject Matter Specialists from Extension Division and any other as required.
3. Adaptive research was conducted in farmers' fields which formed the link between research and extension. Regional Research Centers were responsible for planning, executing and supervising the programs which included field trials on new varieties, improved cultural practices and use of inputs for all field crops as these technologies emerge from the Research Centers and their sub-stations.
4. Farm families covered by each KVS (average 750) were divided into clusters from which contact farmers were identified to expose fully, through fortnight visits, to information (messages) from beginning to end of the season. The contact farmers, intern were expected to propagate the messages among the farmers.

With the termination of the project in 1986, it was observed that the paddy yields had tended to stagnate and the single crop approach was no longer adequate in a multi-crop situation which demanded a whole farm approach. The cost of operating the extension system too became prohibitively high. Following the enactment of the 13<sup>th</sup> amendment to the constitution in the 1989, the extension functions of the DOA, except in the inter-provincial irrigation areas, were devolved to the Provincial Councils. Further, the KVAs of the DOA were absorbed to the Ministry of Public Administration to fill up the vacancies created by a substantial increase in their cadre of Grama Niladharis (GNs). The loss of KVAs as village level extension officers created a vacuum in the extension system.

### 1.2.3 Second Agricultural Extension Project

In order to revitalize the disrupted extension services, the World Bank funded Second

Agricultural Extension Project (SAEP) was implemented from 1993. The strategy was based on the farmer centered, holistic farming system approach with integration of extension services of a number of agencies. It was a 'bottom up' participatory approach where the farmer needs were identified through application of problem census, problem analysis and problem solving techniques. An Integrated Agricultural Extension Work Plan for the area is developed and the extension agent served as a facilitator in addressing farm problems that were more general in nature.

For implementation of SAEP, Provincial Extension Teams (PET) were set up at the provincial level comprising of officers of DOA, DAP&H, Coconut Cultivation Board (CCB), and the Department of Export Agriculture (DEA) for the purpose of setting up priorities and for resource allocation. At the district level, Guide Teams (GTs) comprising of corresponding district officers for providing logistic support to field level, the Field Extension Teams (FETs) were constituted. FET consisted of AI (DOA/PDOA), Livestock Development Officers (PDAP&H) and in some areas, Extension Officer (DEA), and operated from the ASCs of the DAD. All FET members possessed two year Diploma in Agriculture and to improve extension coverage each was assigned a specific geographic area within the ASC and they were expected to consult each other on appropriate technical matters in providing routine extension services to the farmers.

At the field level, the FET followed a participatory approach involving all farmers in the range where problem census technique was applied through semi-structured interviews. This was followed by preparation of an action plan for the area. Later, a problem solving component, with direct farmer involvement, was introduced to FET procedure.

The SAEP strategy failed to take root due to number of reasons.

- 1) FET team being a technology provider failed to address some of the major issues identified by the farmers at the problem census. The integration was more or less confined to different branches of extension service. It could only inform the relevant authorities on farmer's problems relating to, e.g. irrigation, marketing, credit, etc. In many instances, agricultural technology in the form of extension was not the priority among farmers needs at the particular time under prevailing conditions.
- 2) Members of the FET team were attached to their respective line departments and, besides general agricultural extension work under the strategy, were required to carry out the departmental development programs. This situation led to a conflict among priorities.
- 3) DOA, as the implementer under the SAEP, received most of the resources, particularly the vehicles, which all the participants were required to share. This arrangement was not well received by other agencies at all levels causing the interest on the program to wane.

As the performance of the SAEP was not satisfactory, the project was terminated in 1998, one year ahead of the schedule. With the termination of the SAEP the integrated strategy ceased to operate and the agencies opted to revert back to their mandated functions.

#### 1.2.4 Present Situation

In the absence of a uniform extension strategy, group extension approach is commonly applied in conducting normal extension programs. Participatory techniques such as RRA and PRA are used in a limited way in identifying farmer needs for extension program planning. Further, the Provincial Technical Working Group (PTWG) meetings, renamed from the RTWG introduced under the AEARP, provides the forum to decide on the provincial and inter-provincial extension plan. The main extension strategies in the paddy sector are the 'Yaya' or Tract Paddy Production program and the One Acre Maximum Yield Demonstration Program. The Tract program was later incorporated into the Granary Area Program (GAP) as its production component. GAP was implemented in 7 districts covering an area of 267,000 ha from 2003/04 Maha season and the entire area of 267,000 ha is scheduled to be covered over a 5 year project period.

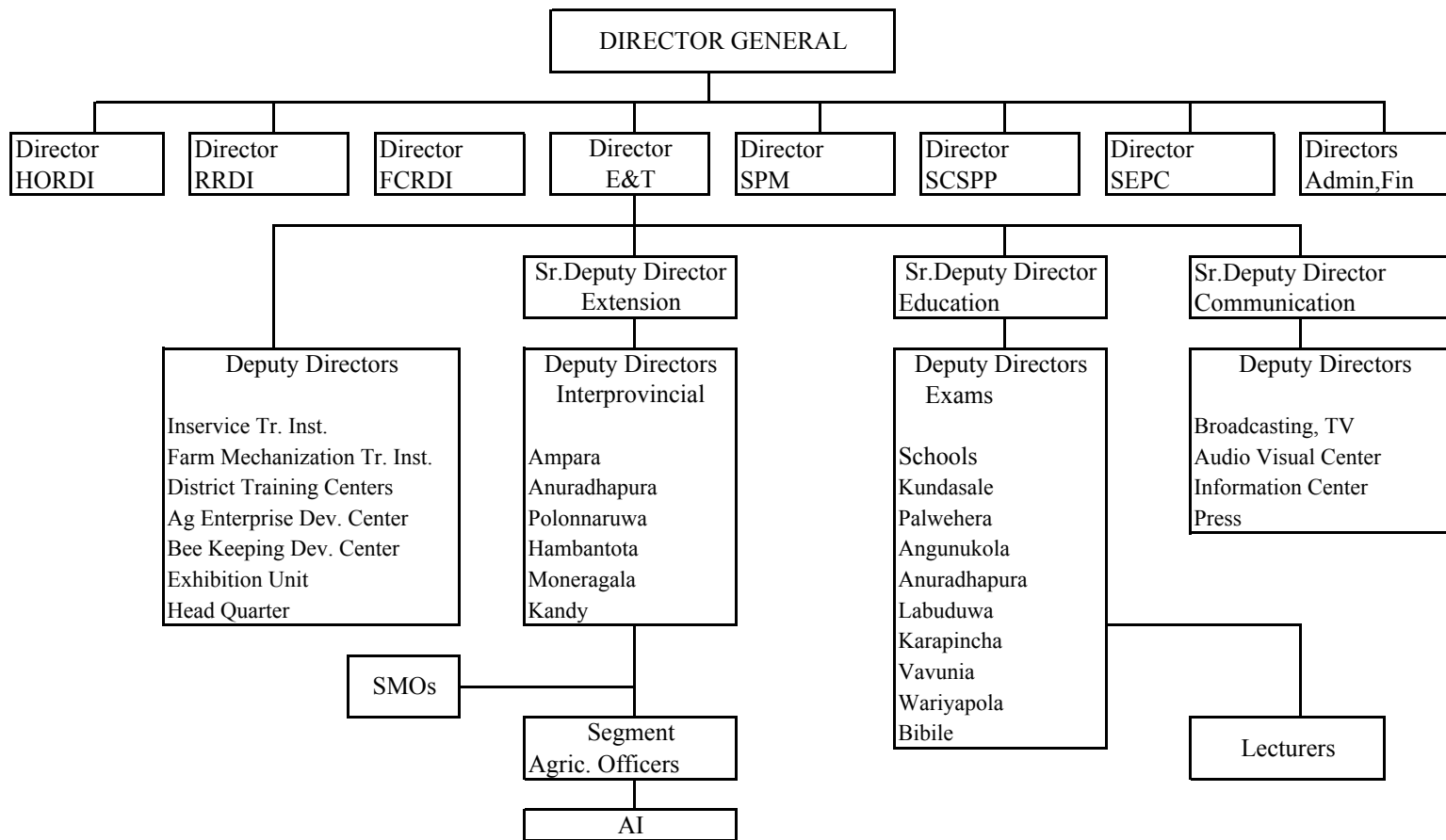
### 1.3 Agricultural Extension Organizations

A complex structure of institutions, dealing directly and indirectly in providing extension services to the farmers has developed over the years. These include central and provincial government departments, public and private sector agencies and NGOs. The state organizations play the major role as the extension service providers and are briefly described below.

#### 1.3.1 Central DOA

The service provided by the DOA is the most extensive as far as the food sector is concerned. The Extension and Training Division of DOA is well supported by 3 specialized research institutes, as well as Plant Protection, Seed & Planting material and Economic Planning Divisions. The organization structure of DOA is shown in **Figure B 1.3.1**.

Following the devolution of extension function from central government to provincial councils in 1989, the Agricultural extension service of the DOA was confined to inter-provincial major irrigation areas of Ampara, Anuradhapura, Polonnaruwa, Hambantota, Moneragala and Kandy districts. The district inter-provincial offices are headed by Assistant Directors and are assisted by segment AOs and a team of SMOs. The segment AOs are assisted by AIs placed at ranges as the field level officers and the ARPAs attached to ASCs as village level officers are expected to assist in field work of the AIs on 3 working days a week. Besides the extension in inter-provincial areas, the division is vested with related duties of national interest, namely, 1) coordination and collaboration of national extension programs with other extension agencies, 2) supporting the extension system by collection, management and dissemination of information, 3) training of extension staff, agricultural entrepreneurs and farmers. And 4) involving in the provision of vocational and technical education in agriculture for youth.



- HORDI :Horticultural Research and Development Institute
- RRDI :Rice Research and Development Institute
- FCRDI :Field Crops Research and Development Institute
- E&T :Extension and Training Division
- SPSPP :Seed Certification and Plant Protection
- SEPC :Socio-Economic Planning Center
- SPM :Seed and Planting Material Division

Source: Central Department of Agriculture

**Figure B 1.3.1 Organization Structure of Central Department of Agriculture**

### 1.3.2 Provincial DOA

Agricultural extension services in areas outside the major and medium irrigation schemes are provided by the provincial administration under the Provincial DOA which is headed by the Provincial Director. At district level, the P DOA is headed by Deputy Directors who are supported by Assistant Directors (Ads) assigned to cover segments, based on agro-ecology and farming systems, and a set of SMOs. As in the central DOA, the AIs, placed under the ADs are the front line extension agents and are located at the ASCs. Depending on the needs of the area, one or more AIs may operate from one ASC. staff cadres similar to those at district offices of the central DOA. The organizational structure of the provincial DOAP&H is shown in **Figure B 1.3.2**.

### 1.3.3 Provincial Department of Animal Production and Health (PDAP&H)

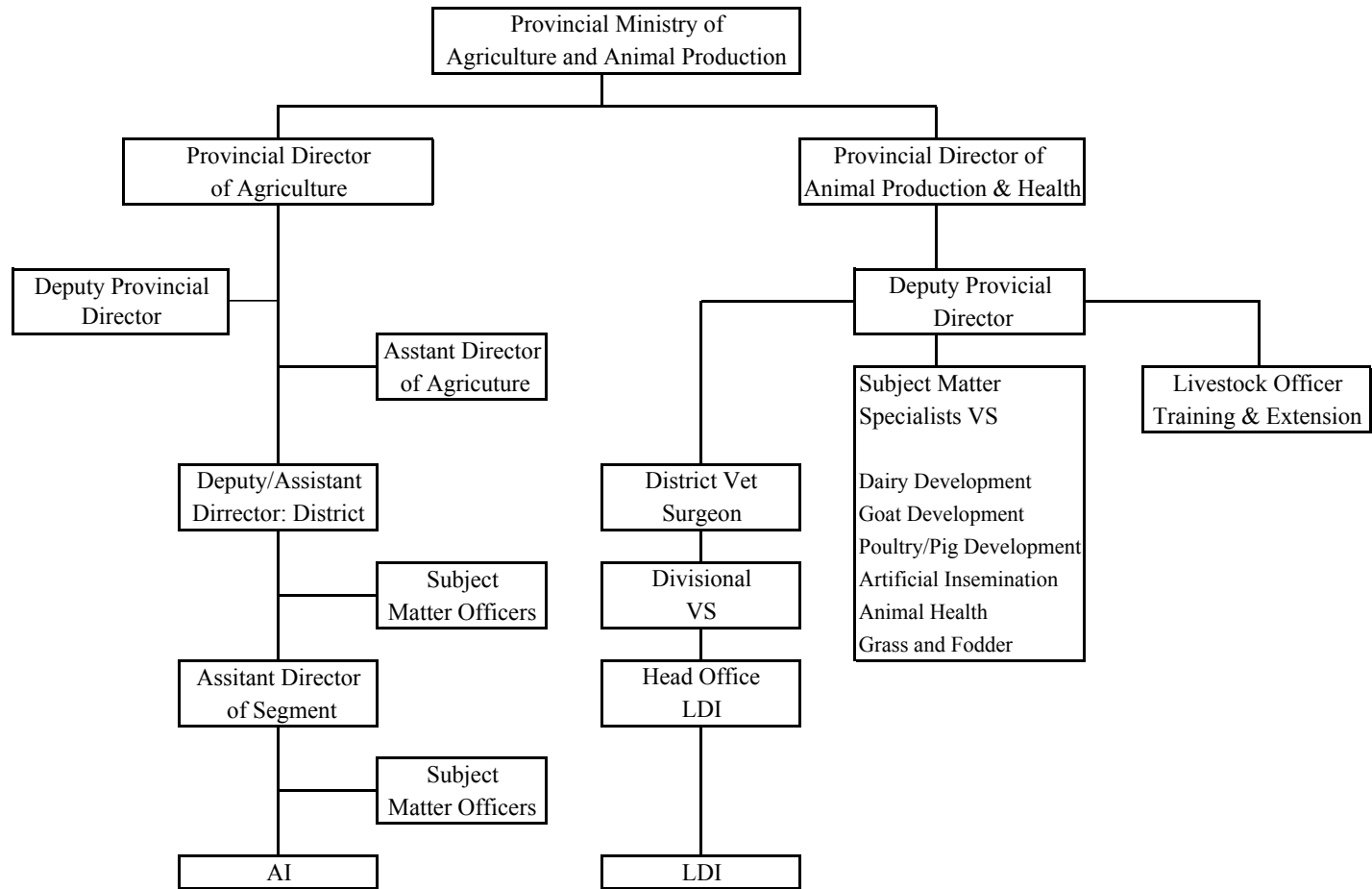
The extension services on livestock has been fully devolved to the provincial councils, and the Provincial DAP&H, headed by the Provincial Director who is assisted by a Deputy Director and a team of Subject Matter Specialists (SMSs) on poultry, dairy, goat and swine. Field extension activities are carried out through the field extension service units located at the DS area level. The extension units headed by Veterinary Surgeons (VSs) are assisted by Livestock Development Instructors (LDIs) who are the front line extension workers. The technical and training support for the provincial DOAP&H are provided by the central Department of Animal Production and Health. The organizational structure of the provincial DOAP&H is shown in **Figure B 1.3.2**.

### 1.3.4 Coconut Cultivation Board (CEB)

The CEB provides extension services to coconut small holdings sector. During the implementation period of SAEP from 1993 – 1998, CEB was a collaborating agency in the integrated extension strategy, an effort had been made to concentrate on coconut extension activities without disturbing the line agency functions. With the termination of SAEP, the extension activities of the CEB are somewhat limited to administration of the subsidy schemes and to distribution of certified coconut seedlings to the growers. These activities are carried out from district level offices of the Coconut Development Officers through Field Officers. The research and administration inputs are provided by the Coconut Research Institute and the CEB head office.

### 1.3.5 Cashew Corporation

Very limited extension service is provided by the cashew corporation. Their efforts are concentrated on cashew growing regions located in the dry zone of the country and are mainly concerned with administration of the subsidy scheme.



Source: Provincial Department of Agriculture, Animal Production and Health, North Central Province

**Figure B 1.3.2 Organization structure of Provincial Department of Agriculture and Animal production & Health**



### 1.3.6 Private Sector Organizations

The private sector agricultural initiatives cover a broad range of activities and their advisory services are largely product related as well as market oriented. The information provided is promotional and the mode of contact is a combination of methods, such as individual visits, group meetings, field demonstrations and high pressure advertising. Extension of this nature is observed with private sector input suppliers. Besides these, some organizations provide advice to farmers along with input packages on specific commodities, often on forward contract agreements. In general, the private sector extension services are confined mostly to areas where the potential for marketing the products or commodities are high, thereby yielding a reasonable return to their efforts and investment.

### 1.3.7 Non Governmental Organizations

A major objective of the NGOs is to facilitate up-liftment of socioeconomic status of the poorer sections of the society. Agricultural training and extension services are components often taken up under these programs for development, either directly or in collaboration with relevant training/extension agencies. The NGOs follow a demand driven approach, that emphasize community participation at all stages of program planning and implementation, and falls in line with the proposed national extension policy

## 1.4 Crop Production and Yield

The principle crop in the region is paddy, and Anuradhapura district accounts for 10% of the total national paddy cultivation area, both in the Maha and Yala Seasons. The region also contributes to the national production of highland crops as well. Production area and the average unit yields for Anuradhapura, Kurunegala and Polonnaruwa, the major paddy producing districts, are shown in **Table B 1.4.1** and **Table B 1.4.2**. Production data on other field crops in Anuradhapura, Kurunegala and Puttalam districts are shown in **Table B 1.4.3**.

**Table B 1.4.1 Paddy Extent Sown and Harvested: Major Irrigation Schemes**

Season	Sown Area (ha)				Harvested Area (ha)			
	Major	Minor	Rainfed	Total	Major	Minor	Rainfed	Total
<b>Anuradhapura District</b>								
Maha 1999/2000	25,577	29,446	1,520	56,543	24,554	28,268	1,460	54,282
Yala 2000	15,514	5,699		21,213	14,583	5,244		19,827
Maha 2000/2001	19,068	21,220	511	40,799	18,972	21,114	509	40,595
Yala 2001	11,846	5,661		17,507	11,846	5,629		17,475
Maha 2001/2002	25,187	21,365	639	47,191	25,161	21,265	639	47,065
Yala 2002	9,360	2,987		12,347	8,892	2,838		11,730
Maha 2002/2003	27,351	35,173	3,531	66,055	25,983	33,415	3,355	62,753
Yala 2003	16,425	7,145		23,570	15,111	6,573		21,684
<b>Kurunegala District</b>								
Maha 1999/2000	11,226	28,557	27,932	67,715	10,890	27,701	27,094	65,685
Yala 2000	9,866	13,074	11,237	34,177	6,248	7,379	4,111	17,738
Maha 2000/2001	7,577	15,613	22,341	45,531	7,573	15,329	21,490	44,392
Yala 2001	10,006	19,536	16,644	46,186	9,630	12,243	4,695	26,568
Maha 2001/2002	10,224	22,939	25,413	58,576	10,224	21,752	23,704	55,680
Yala 2002	10,937	25,808	22,202	58,947	9,996	23,316	18,262	51,574
Maha 2002/2003	12,888	33,638	29,197	75,723	10,995	28,592	24,816	64,403
Yala 2003	11,006	26,863	20,568	58,437	10,125	24,714	18,922	53,761
<b>Polonnaruwa District</b>								
Maha 1999/2000	2,624	5,610	1,140	9,374	2,519	5,386	1,094	8,999
Yala 2000	4,346	1,607	285	6,238	4,085	1,478	257	5,820
Maha 2000/2001	2,001	2,900	618	5,519	1,991	2,885	614	5,490
Yala 2001	4,501	2,977	124	7,602	4,406	2,369	56	6,831
Maha 2001/2002	3,936	4,368	724	9,028	3,186	3,671	516	7,373
Yala 2002	5,509	4,726	367	10,602	5,233	4,489	349	10,071
Maha 2002/2003	6,566	8,300	1,079	15,945	6,237	7,885	1,025	15,147
Yala 2003	5,722	5,388	583	11,693	5,264	4,957	536	10,757

Source: Statistical Abstract 2004, Dept of Census and Statistics

**Table B 1.4.2 Paddy Production and Average Yield per ha**

Season	Anuradhapura District		Kurunegala District		Polonnaruwa District	
	Production 000' mt	Av. Yield kg	Production 000' mt	Av. Yield kg	Production 000' mt	Av. Yield kg
Maha 2000/2001	146	4,474	160	3,601	17	3,561
Yala 2001	207	4,873	82	3,101	20	3,423
Maha 2001/2002	198	4,627	196	3,521	21	3,314
Yala 2002	40	4,190	165	3,207	28	3,225
Maha 2002/2003	219	4,341	227	3,520	40	3,108
Yala 2003	68	3,891	170	3,170	29	3,224

Source: Statistical Abstract - 2004, Department of Census and Statistics

**Table B 1.4.3 Cultivated Area, Production and Yield of Highland Crops**

**Anuradhapura District**

	Kurakkan	Maize	Greengram	Cowpea	Gingelly	Groundnut	Manioc	Gr. Chilli	Big Onion
<b>Cultivated Area (ha)</b>									
Maha 2001/2002	1,472	3,469	460	879	329	227	684	3,842	
Yala 2002	37	264	81	138	1,120	60	387	708	582
Maha 2002/2003	1,721	5,480	542	1,017	429	405	709	4,180	
Yala 2003	79	270	81	151	1,651	44	312	528	703
<b>Production (mt)</b>									
Maha 2001/2002	1,002	3,130	378	679	203	125	5,423	13,336	
Yala 2002	25	306	61	143	619	54	1,916	2,717	6,511
Maha 2002/2003	1,270	5,081	459	880	281	214	5,668	15,033	
Yala 2003	52	320	57	151	869	37	1,565	2,065	8,123
<b>Average Yield (mt/ha)</b>									
Maha 2001/2002	0.68	0.90	0.82	0.77	0.62	0.55	7.93	3.47	
Yala 2002	0.68	1.16	0.75	1.04	0.55	0.90	4.95	3.84	11.19
Maha 2002/2003	0.74	0.93	0.85	0.87	0.66	0.53	7.99	3.60	
Yala 2003	0.66	1.19	0.70	1.00	0.53	0.84	5.02	3.91	11.55

**Kurunegala District**

	Kurakkan	Maize	Greengram	Cowpea	Gingelly	Groundnut	Manioc	Gr. Chilli	Big Onion
<b>Cultivated Area (ha)</b>									
Maha 2001/2002	362	705	1,247	879	108	395	1,635	737	30
Yala 2002	46	122	425	327	321	335	1,650	419	49
Maha 2002/2003	359	709	1,242	876	115	395	1,632	734	27
Yala 2003	45	118	425	325	320	331	1,596	423	49
<b>Production (mt)</b>									
Maha 2001/2002	335	698	798	594	63	174	13,938	1,664	142
Yala 2002	26	119	309	214	203	132	12,842	1,000	274
Maha 2002/2003	328	706	820	638	52	177	14,337	1,678	136
Yala 2003	25	122	320	227	197	133	13,505	1,052	274
<b>Average Yield (mt/ha)</b>									
Maha 2001/2002	0.93	0.99	0.64	0.68	0.58	0.44	8.52	2.26	4.73
Yala 2002	0.57	0.98	0.73	0.65	0.63	0.39	7.78	2.39	5.59
Maha 2002/2003	0.91	1.00	0.66	0.73	0.45	0.45	8.78	2.29	5.04
Yala 2003	0.56	1.03	0.75	0.70	0.62	0.40	8.46	2.49	5.59

**Puttalam District**

	Kurakkan	Maize	Greengram	Cowpea	Gingelly	Groundnut	Manioc	Gr. Chilli
<b>Cultivated Area (ha)</b>								
Maha 2001/2002	86	399	517	580	280	503	381	566
Yala 2002	40	191	256	292	152	319	440	358
Maha 2002/2003	125	355	475	464	318	524	495	644
Yala 2003	59	173	218	222	137	280	400	410
<b>Production (mt)</b>								
Maha 2001/2002	47	427	453	571	161	167	1,839	1,720
Yala 2002	20	80	168	239	72	157	2,262	1,358
Maha 2002/2003	68	287	411	439	182	168	2,382	1,947
Yala 2003	32	73	138	186	66	138	2,032	1,135
<b>Average Yield (mt/ha)</b>								
Maha 2001/2002	0.55	1.07	0.88	0.98	0.58	0.33	4.83	3.04
Yala 2002	0.50	0.42	0.66	0.82	0.47	0.49	5.14	3.79
Maha 2002/2003	0.54	0.81	0.87	0.95	0.57	0.32	4.81	3.02
Yala 2003	0.54	0.42	0.63	0.84	0.48	0.49	5.08	2.77

Source: Statistical Abstract - 2004, Department of Census and Statistics

## Chapter 2 PRESENT CONDITION OF THE STUDY AREA

### 2.1 Agricultural Condition

#### 2.1.1 Agro-ecology

The Study area is situated in the DL 1b Agro-ecological Region (AER), which is characterized by 75% probability annual rainfall of greater than 775 mm, Ground Elevation less than 300m MSL and an undulating terrain of Reddish Brown Earth (RBE) – Low Humic Gley (LHG) soil association. The land use consists of rain-fed upland crops, paddy, shrub, mixed home gardens and forest plantations.

##### (1) Rainfall

The Study area receives an annual rainfall of 1000 – 1500 mm which is distributed in a well expressed bi-modal pattern. The convectional rainfall regime is greatly influenced by the tropical monsoons, the north-east and the south-west. The north-east monsoon, which accounts for about 70% of the annual rainfall, occurs from December to February and the south-west, the lesser monsoon occurs from March to May. Convectional rain experienced during the two inter-monsoonal periods is unstable, but the convectional and depressional rains that occur in the October-November period is relatively better balanced. Rainfall data recorded for Anuradhapura district for last five years are shown in **Table B 2.1.1**

**Table B 2.1.1 Mean Monthly Rainfall in Anuradhapura District (1999-2003 average)**

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Rainfall (mm)	133	68	41	151	20	42	31	28	76	193	268	181	1231

Source: Statistical Abstract - 2004, Department of Census and Statistics

##### (2) Temperature

The average monthly temperature recorded in the Study area shows that the variation is low and ranges between 25.3 and 29.2<sup>o</sup> C. The lowest temperatures are recorded for the months of January and February and the highest for April and May. The mean diurnal temperature in the area is about 10<sup>o</sup> C. The range of temperatures experienced in the area is not a limiting factor for agriculture. The mean annual and monthly temperatures for Anuradhapura are shown in **Table B 2.1.2**

**Table B 2.1.2 Mean Monthly Temperature in Anuradhapura (1999-2003 average)**

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Temperature (°C)	26.1	27.2	29.1	29.4	29.7	29.0	29.4	29.2	29.7	28.0	27.0	26.3	28.4

Source: Statistical Abstract - 2004, Department of Census and Statistics

##### (3) Radiation

The duration of sunshine received in the Study area is about 2,500 sunshine hours per year. During the February to early March period, the region records daily solar radiation values greater than 400 cal/cm<sup>2</sup>, while it falls to 300 in the month of December.

#### (4) Soil

Soils of the region including the Study area, described by Panabokke (1996), consist of soils occurring in a catenary sequence with the well drained RBEs on the upper and mid slopes of the undulating terrain, and the poorly drained LHGs in the lower slopes and valley bottoms. A narrow strip of alluvial soils occurs along the natural streams. Due to the impervious basement rock, ground water level in the soil builds up rapidly during the rainy season and the bottom lands remain poorly drained while the mid slopes of the valley imperfectly drained during a greater part of the year. Almost the whole of the command areas of old and renovated major and minor tanks of the dry zone are made up of LHG soils. The moderately fine textured hydromorphic LGHs are predominantly used for wetland rice production and have a high yield potential. Long term studies on paddy-paddy cropping pattern in these soils have established that the practice is both stable and sustainable.

## 2.2 Socio-Economic Condition

In order to grasp the present socio-economic and agricultural condition in the Study area, surveys were conducted in the three selected pilot areas, namely, Sri Udara FO in LB Tract 2 of Rajangana, Isuru FO in LLD of Nachchaduwa and Mahanama FO in the Thuruwila medium irrigation scheme. Information on socio-economic situation were collected through questionnaire survey. A questionnaire was intentionally designed to be short and simple due to several reasons; (a) to minimize the duration of the interview since the farmers were fully engaged in land preparation at the time the survey field work was carried out, (b) the two DAs (later increased to four DAs) who worked as enumerators had no previous experience and had to be given on the job training, and (c) short time period available for completion of the assignment. The questionnaire used in the survey is shown in **Attachment B 1**.

The listings of members collected from each FO contained only the paddy land owners and did not provide the actual position with regard to the field operators who were lease and tenant cultivators. The land owners did not want the tenants and lessees operating on their lands to be registered as FO members as it will enable them to pay the acre tax to the ASCs, thereby receiving an official recognition as operators, creating some hold on the land. A farmer who wishes to officially parcel out his original land holding among his children, had to register such allocations in the land register maintained by the ASC. This register, called the 'Pangu List', is expected to be updated twice a year, but it was found not to be the case. Another source for a listing was from the GN of the area. It was observed that the GN's area did not coincide with that of the FO and included areas outside the project area and non farm operators as well. Because of this situation, the FO lists were used to select a randomized sample. In the conduct of the survey, the selected fields were visited and the operator, irrespective of his status; owner, descendent, tenant or lessee, was picked-up as a survey element.

A sample of 97 respondents, 27, 37 and 33 operators from Nachchaduwa, Thuruwila and Rajangana pilot FO areas, respectively, were selected randomly from the FO lists out of the approximately 1,000 farm families. The findings of the survey are presented below and summarized in **Table B 2.2.1**

#### 2.2.1 Household Occupants and Contribution to Farm Labour

The mean family size in the survey sample was between 4 – 5 members, and the total number of occupants per house-hold was 4.8. The mean house-hold or family labour contribution for farm work was 1.7, the highest recorded at Thuruwila.

#### 2.2.2 Land Tenure

The land tenure showed a wide variation among the 3 areas studied. The main tenure categories recognized are (i) own land, which may be grants under the Land Development Ordinance, inherited by tradition or descent, or land acquired through outright purchase or forfeiture by default of mortgages, (b) lands leased in on seasonal or long term basis, (c) lands operated by tenant farmers, and (d) lands operated on rotation basis (thattumaru). Over 88% of the farmers in Rajangana and 60% in Thuruwila were owner operators. Thattumaru system was more prevalent in Thuruwila at 7.5%, while it was insignificant in the other locations. The percentage of tenant and lessee farmers was highest in Nachchaduwa at 56%.

#### 2.2.3 Farm Holding

Farm holdings with irrigated extents cultivated by the operators in Nachchaduwa and Rajangana averaged around 1 ha, while it was less in Thuruwila at 0.6 ha. Nachchaduwa farmers had larger homesteads (0.41 ha) and in Thuruwila and Rajangana, the average extent was about 0.29 ha. The component 'Others' classified under farm holding included agricultural lands located outside the scheme, and are usually highlands. These may be privately owned or lands obtained under annual LDO permits. The average total farm holding ranged between 1.1 ha and 1.7 in the 3 areas studied.

An analysis of the irrigated paddy lands by size showed that the distribution is highly skewed with over 42% of the respondents operating on land area of 0.4 ha (1 Ac) or less in extent. Thuruwila had the highest proportion of farmers (58%) holding less than 0.4 ha of irrigated paddy lands. The distribution is shown in **Table B 2.2.2**.

Table B 2.2.1 Result of Socio-economic Survey

Items	Category	Unit	Nachchaduwa	Thuruwila	Rajangana	Mean
<b>(1) Household Occupancy &amp; Labor Contribution</b>						
	Nucleus (Avg)	Nos	1.8	1.8	1.9	1.8
	Children	Nos				
	Young	Nos	0.7	0.7	0.9	0.8
	Dep.Adults	Nos	0.9	0.8	0.3	0.7
	Indi.Adults	Nos	1.4	0.8	1.2	1.1
	Total Family	Nos	4.8	4.1	4.3	4.4
	Others	Nos	0.4	0.4	0.4	0.4
	Total Household	Nos	5.2	4.5	4.7	4.8
	Labour Contribution for field work	Nos	1.4	1.9	1.7	1.7
<b>(2) Land Tenure</b>						
	Own (inherit/purch)	%	44	60	89	65
	Leased in	%	24	11	0	12
	Tennent	%	28	21	11	19
	Thattumaru	%	4	8	0	4
<b>(3) Farm Holding</b>						
	Irrigated (sub-total)	ha	1.10	0.91	0.65	0.89
	-Own	ha	0.48	0.62	0.52	0.54
	-Tenant	ha	0.52	0.13	0.10	0.25
	-Leased	ha	0.10	0.16	0.03	0.10
	Homestead	ha	0.41	0.28	0.29	0.33
	Other	ha	0.23	0.34	0.18	0.25
	Total	ha	1.74	1.54	1.12	1.47
<b>(4) (a) House Condition</b>						
	No of Rooms	Nos	2.6	2.8	3.3	2.9
	Toilet	Nos	1.0	1.0	1.0	1.0
	Water Supply %					
	Own Wells	%	88.0	66.7	63.6	72.8
	Common Wells	%	20.0	58.3	39.4	39.2
	Tube Wells	%	12.0	5.7	12.1	9.9
<b>(b) House construction</b>						
	Roof					
	Cadjan	%	16	3	3	7.3
	Asbestos	%	56	58	6	40.0
	Tin Sheets	%	0	3	0	1.0
	Tile	%	28	36	91	51.7
	Walls					
	Mud	%	16	3	3	7.3
	Brick	%	36	36	46	39.3
	Brick + Plastered	%	48	61	51	53.3
	Floor					
	Cement	%	88	86	85	86.3
	Mud	%	12	14	15	13.7
	Electricity	%	84	81	67	77.3
<b>(5) Home Applicants</b>						
	TV	%	81	82	79	80
	Radio	%	77	82	76	78
	Phone	%	42	21	12	25
	Sawing Machine	%	35	39	33	36
	Fan	%	23	39	33	32
	Fridge	%	19	16	3	13
	Kitchen Equipment	%	42	18	18	26
<b>(6) Transport</b>						
	Item	%	N'duwa	Th'wila	R'gana	Mean
	Car/Van	%	0	3	0	1
	Truck	%	0	3	0	1
	Motorbike	%	31	53	36	40
	Pushbike	%	154	118	127	133
	3-Wheeler	%	8	5	0	4
<b>(7) Farm Machinery &amp; Equipment</b>						
	4w Tractor	%	0	11	6	6
	2W Tractor	%	19	29	18	22
	Thresher	%	0	5	0	2
	Sprayer	%	54	61	39	51
	Water Pump	%	12	11	3	8
	Trailer	%	12	11	18	13
	Rotorvator	%	19	26	9	18
	Tyne Tiller	%	0	5	6	4

Source: Socio Economics Survey -the JICA Study Team

**Table B 2.2.2 Distribution of Irrigated Paddy Lands by Size**

(Unit: %)

Size of Holding (ha)	Nachchaduwa	Thuruwila	Rajangana	Mean
0.4 or less	36.0	57.9	28.1	42.1
>0.4 – 0.8	20.0	18.4	50.0	29.5
>0.8 – 1.2	36.0	7.9	15.6	17.9
>1.2 – 1.6	4.0	7.9	6.3	6.3
>1.6 – 2.0	0.0	0.0	0.0	0.0
>2.0	4.0	7.9	0.0	4.2

Source: Socio Economic Survey – JICA Study Team- 2005

#### 2.2.4 Housing Condition

On average, nearly 90% of the houses in the surveyed area were of permanent construction with asbestos or tiled roofs, brick or plastered brick walls and cement floors. Thuruwila and Nachchaduwa were slightly ahead of Nachchaduwa in this regard. Each house on the average had 3 rooms and over 75% had electricity supply. All had permanent toilets, and the most common source of water supply was private wells (73%).

#### 2.2.5 Home Appliances

Over 80% of the families covered in the survey had TV sets (battery operated where electricity was not available), nearly 80% possessed radios and 25% telephones, either land or mobile. Although an in-depth study on the possession of household appliances was outside the scope of the study, it was apparent that most of these items have been purchased by the children who are employed in non-farm sectors.

#### 2.2.6 Transport

The most common means of family transport was push-cycle or bicycle, each family surveyed owning at least one unit. 40% of the respondents had motorcycles, while little over 4% owned 3 wheelers. However, in some instances, the motorcycles and particularly the 3 wheelers belonged to independent children who were employed outside the farm.

#### 2.2.7 Farm Machinery and Equipment

More than half of the families in the survey owned sprayers while 22% owned 2 wheel tractors, Thuruwila leading with 29%. 18% of the farmers owned rotorvators while some reported that this attachment was unserviceable and therefore not included.

#### 2.2.8 Household Income

In recording the data, the net income derived from 6 pre-determined sources were collected. Income from sources outside these were categorized under 'Others', as there was a wide variation as well as inconsistencies in the data collected. Depending on the source, the income was recorded on monthly, seasonal or annual, and converted later to annual base.



The net household income in the survey area averaged to Rs. 143,000, of which 68% was derived from agricultural operations. Paddy reserved for household consumption, settlement of land tenancies and leases were excluded in computing the income, as were crops such as coconut, fruits, etc that were consumed by the family. Income from foreign and local remittances from family members and earnings from skilled work as masons, carpenters and mechanics are categorized under ‘Others’. This also included 6 farmer fishermen who were engaged in fresh water fishery industry in the Thuruwila tank. In the computation, salaries and wages earned by family members, married or single, and were living in or away from the house were not accounted for as the respondents claimed that, as independent children, they were not contributing significantly to the household expenses. Further, the respondents were reluctant to divulge foreign remittances they received from family members working abroad though it contributed directly to the family income. One reason for the poor response to this enquiry arises from the fact that such income was often not regular but periodical. Of the other income sources, the highest contribution came from the earnings from labour work. The details are shown in **Table B 2.2.3**

**Table B 2.2.3 Household Income**

(Unit: Rs.)

Item	Nachchaduwa	Thuruwila	Rajangana	Mean
Agriculture	123,331	92,065	73,690	96,662
Livestock	554	1,454	157	722
Labour Wages	11,507	9,289	14,424	11,740
Trading	14,523	2,662	3,451	6,879
Hire of Machinery	2,153	1,325	6,303	3,260
Samurdhi	671	1,871	2,040	1,527
Others	25,428	17,075	23,075	21,859
Total	178,167	126,641	123,140	142,649
% Agriculture	69.22	73.41	59.84	67.76
% Other Sources	30.78	26.59	40.16	32.24

Source: Socio Economic Survey – JICA Study Team- 2005

A frequency analysis of the total mean income shows that the distribution is skewed, with over 53% of the respondents having annual income below Rs. 100,000. Thuruwila recorded the lowest income group with over 60% of the respondents having an annual income of less than Rs. 100,000, followed by Nachchaduwa and Rajangana with 57% and 51%, respectively. Income from agricultural pursuits too showed the same trend, the annual average income of over 72% of the respondents falling below the Rs. 100,000 level, with Nachchaduwa, Thuruwila and Rajangana recording 80%, 73%, and 63%, respectively. Income distributions are summarized in **Tables B 2.2.4** and **B 2.2.5** below.

**Table B 2.2.4 Distribution of Annual Agricultural Income**

(Unit:%)

Annual Income (Rs)	Nachchaduwa	Thuruwila	Rajangana	Mean
25,000 and less	15.4	23.5	21.2	20.6
>25,000 – 50,000	23.1	21.1	18.2	20.6
>50,000 – 75,000	19.2	15.8	21.2	18.6
>75,000 – 100,000	23.1	13.2	3.0	12.4

Annual Income (Rs)	Nachchaduwa	Thuruwila	Rajangana	Mean
>100,000 – 125,000	3.8	2.6	12.1	6.2
>125,000 – 150,000	3.8	5.3	15.2	8.2
>150,000 – 175,000	0.0	5.3	6.1	4.1
>175,000 – 200,000	0.0	0.0	3.0	1.0
>200,000	11.5	13.2	0.0	8.2

Source: Socio Economic Survey – JICA Study Team- 2005

**Table B 2.2.5 Distribution of Total Annual Income**

(Unit:%)

Annual Income (Rs)	Nachchaduwa	Thuruwila	Rajangana	Mean
25,000 and less	0.0	5.3	12.1	6.2
>25,000 – 50,000	23.1	7.9	15.2	14.4
>50,000 – 75,000	11.5	31.6	21.2	22.7
>75,000 – 100,000	23.1	15.8	3.0	13.4
>100,000 – 125,000	11.5	7.9	12.1	10.3
>125,000 – 150,000	7.7	2.6	15.2	8.2
>150,000 – 175,000	3.8	7.9	9.1	7.2
>175,000 – 200,000	0.0	5.3	3.0	3.1
>200,000	19.2	15.8	9.1	14.1

Source: Socio Economic Survey – JICA Study Team- 2005

### 2.2.9 Household Expenditure

Collecting reliable data on household expenditure was difficult as the respondents tended to exaggerate the figures. Due to apparent high value recorded for the item ‘Payment of Interest’, the data were re-examined in a supplementary survey. It was observed that some of the respondents had included the loan repayment component in their response thereby inflating the figure. An adjustment was therefore made to the values given in the Progress Report I.

The revised average annual household expenditure is shown in **Table B 2.2.6**. The highest expense incurred by an average family was for food and beverages, with transport, clothing and educational expenses next in order. The total annual expenditure per household averaged to Rs. 87,000.

**Table B 2.2.6 Household Expenditure**

(Unit:Rs)

Item	Nachchaduwa	Thuruwila	Rajangana	Mean
Payment of Interest	3,100	1,900	5,200	3,400
Food & Beverages	38,000	44,900	36,600	39,933
Clothing	7,400	6,600	6,400	6,800
Transport	9,500	9,300	9,600	9,467
Functions	6,100	4,200	7,300	5,867
Health	5,100	4,900	6,200	5,400
Education	7,000	3,600	9,500	6,700
Entertainment	2,800	3,700	4,400	3,633
Electricity	1,200	2,300	2,200	1,900
Others	2,900	5,200	3,500	3,867
Total	83,400	86,600	90,900	86,967

Source: Socio Economic Survey – JICA Study Team- 2005

## 2.2.10 Farm Economy

In the computation of household expenditure above, the costs incurred on production of paddy were excluded. Data on production costs were collected separately from group interviews conducted in the three survey areas, and are summarized in **Table B 2.2.7** below. The cost of labour has been computed after deduction of the family labour contribution. The details of crop production are discussed in Section

**Table B 2.2.7 Cost of Production of Paddy per Hectare**

				(Unit: Rs)
Cost Item	Nachchaduwa	Thuruwila	Rajangana	Mean
Material	15,435	11,960	11,330	12,908
Machinery	13,836	12,962	12,850	13,216
Labour	22,800	16,600	15,750	18,383
Total	52,071	41,522	39,930	44,508

Source: Socio Economic Survey – JICA Study Team- 2005

In order to determine the average household economy, the available data collected through the field surveys were analyzed. An average price of Rs 15 per kg of paddy was used in the computation as it ranged between Rs. 11 and Rs 17.50 during the year. The higher incomes realized from non-paddy agricultural activities by farmers in Nachchaduwa and Rajangana reflected crop diversification, 17% and 11% respectively, mainly into vegetable and banana production. Paddy income was lowest in Rajangana mainly on account of the small average holding size and the low paddy yield. The average household economy is analyzed in **Table B 2.2.8**.

**Table B 2.2.8 Farm Household Economy**

Item	Nachchaduwa	Thuruwila	Rajangana	Mean
Average Holding (ha)	1.10	0.91	0.65	0.89
Average Paddy Yield per ha (kg)	4,800	5,300	4,210	4,770
Average Production per Farm Holding/Yr (kg)	10,560	9,646	5,473	8,459
Paddy reserved for consumption (kg)	1,400	1,800	1,180	1,460
Paddy surplus for sale (kg)	9,160	7,846	4,293	6,999
Average Farm-gate Price of Paddy (Rs)	15	15	15	15
Gross Income from Paddy Per Household (Rs)	137,400	117,690	64,395	104,982
Cost of Production per Farm Holding (Rs)	114,556	75,570	51,909	80,678
Net Income from Paddy per Household (Rs)	22,844	42,120	12,486	24,304
Income from non-paddy activities (Rs)	159,775	84,588	116,646	120,336
Total Household income (Rs)	182,619	126,708	129,132	144,640
Household Expenditure (Rs)	83,400	86,600	90,900	86,967
Net Household Income (Rs)	99,219	40,108	38,232	57,673

Source: Socio Economic Survey – JICA Study Team- 2005

The sources of household income could further be represented as income generated from

paddy cultivation and non paddy activities. The farm income from non paddy activities is highest in Rajangana followed by Nachchaduwa. As far as the income to farm household from paddy cultivation is considered, the contribution is relatively low except in Thuruwila. Income generated from other crops plays a significant role in farm economy. The main components are coconut, maize, vegetables, pulses and fruit crops grown in home-garden and highlands, and to a lesser extent, in the irrigated lands. In Nachchaduwa, vegetables and banana are grown in the irrigated lands while in Rajangana, the irrigated upland area is cultivated with a variety of crops, both seasonal and perennial, which provide the households with a significant annual income. Income sources and their contributions to the average farm household are presented in **Table B 2.2.9**.

**Table B 2.2.9 Income Sources by Percentage Contribution to Household**

Source of Income	Nachchaduwa		Thuruwila		Rajangana		Mean	
	Value Rs	%	Value Rs	%	Value Rs	%	Value Rs	%
Paddy	22,844	12.8	42,120	33.3	12,468	10.1	24,304	17.0
Other Crops	100,487	56.4	49,945	39.4	61,222	49.7	72,358	50.7
Off Farm	54,836	30.8	34,576	27.3	49,450	40.2	45,987	32.2
Total	178,167	100.0	126,641	100.0	123,140	100.0	142,649	100.0

Source: Socio Economic Survey – JICA Study Team- 2005

## 2.3 Agriculture

### 2.3.1 Land Tenure and Farm Holding

#### 1) Land Tenure

The land tenure patterns have evolved from the ancient feudal system, where the total authority on matters relating to land was vested with the king. Allocation of land was made on the basis of, 1) caste system, 2) services to the state and, 3) regional utilization. Thus, lands were known as ‘gabada-gam’ for use of the king, ‘ninda-gam’ for use of ministers and officials and, ‘vihara-gam’ and devala-gam’ for use of the temples and kovils. Ownership of these lands were associated with the title held, and was usually passed on to the successor when the term ended. The farmers who worked the lands and paid taxes and/or provided services, however, remained unchanged with the right to work the land passing down the generation. Beside these, the land tenure system known as the ‘paraweni or purana’ (traditional) were of special significance as they continue to exist today. The ownership to ‘purana’ lands came into existence through 1) ancestry, 2) awards by the king, 3) offers made by king or individuals to places of worship, and 4) direct purchases.

The major structural changes to the local land tenure pattern were made by the British rulers. The main legislature introduced by them were, 1) State Land Acquisition Ordinance No 12 of 1840 and, 2) Wasteland Ordinance No 1 of 1897. Under these laws, all uncultivated lands and lands for which ownership could not be established were proclaimed as state property. Following grant of independence, a series of legislature were introduced to sort out and regularize the land issues. For this purpose, the lands are classified into

following categories; 1) state lands, 2) ‘paraweni’ or traditional lands, 3) private lands, 4) lands granted under Land Development Ordinance, and 5) lands not claimed by the state.

Land tenure systems operating in the Study area are complex, particularly in the Nachchaduwa scheme. These consist of private lands owned by original settlers in purana villages that were located within the scheme and by outsiders. The outsiders are largely government officials who had acquired large holdings of 5 – 15 ha in extent, in the 1930s. These lands were mostly cultivated by tenant farmers. Following the major floods and ethnic disturbances that occurred in the late 1950s, most of the land owners, particularly those hailing from north and eastern parts of the country, had left the area. Their lands had been either sold or abandoned, and in the latter case, are worked by farmers without a legal authority. A few, however, still continue to maintain the tenant farmer system.

Rajangana scheme, which was inaugurated in mid 1960s, had better organized settlement system or colonization program, where some uniformity in holding size had been maintained in land allocation. The farmers were selected for settlement from old settlements in and around the area as well as from outside areas. In case of the few resettlements, the entire holding had been blocked out and allocated to the operator. The new settlers were granted 0.8 ha of gravity irrigated lowlands and 0.4 ha of lift irrigated highlands, with modifications in the last settled areas. Some of the settlers from around the areas owned lands under minor tank systems and rain-fed highlands outside the scheme.

Thuruwila medium scheme consists mainly of ‘purana’ or traditional villagers. With recent expansion of the command area under the reservoir, new lands have been allocated to the descendents of the old villagers living in and around the scheme.

Farmers in the Thruwila and Nachchaduwa were given government owned crown highlands for chena cultivation under annual permits. However, granting of annual permits has been suspended by the government from 2005/6 Maha season. Some farmers have privately owned highlands.

## 2) Farm Holding

With the increasing population, most of the original land holdings have been subjected to fragmentation and, over the years, land holding per family has continued to diminish. Seasonal leasing in and ‘thattumaru’, (when a lot has several owners, each member cultivate the entire lot on an agreed seasonal rotation) are some of the measures that have been adopted to increase the individual farm holding size. The tendency to increase the farm holding through tenancies and leasing of lands, thereby consolidating the operational size was apparent, particularly in Nachchaduwa scheme. The size of the farm holdings in the areas based on data collected from the socio-economic survey are analyzed in **Table B 2.2.1**.

### 2.3.2 Crop Production and Yield

The decision on the crop calendar for each season is made at the pre-seasonal ‘Kanna’

meetings, chaired by the GA and attended by all relevant officers of the line departments and farmers representatives. Since the crop calendar and extent to be cultivated are based on the water availability of the reservoirs, farmer involvement on the decision is somewhat limited. However, depending on the actual field situation, minor adjustments are made to the dates specified in the calendar at the Project Committee Meetings. Crop calendar extracted from the minutes of the ‘Kanna’ meetings are shown in **Table B 2.3.1**

The main secondary sources for crop production and yields were the Inter provincial office of DD (Agriculture) DOA, Department of Census and Statistics, and the Regional and District offices of DOI. Data collected from the DOI for Rajangana and Nachchaduwa are given in **Table B 2.3.2**. Paddy statistics for major irrigation schemes in Anuradhapura at project level, compiled by the Department of Census and Statistics for INMAS, and GAP are presented in **Table B 2.3.3**

Besides these, data was also collected through field surveys conducted during the Study. Production and yield figures obtained through interview survey of FOs are shown in **Table B 2.3.4.**, and through questionnaire survey are given in **Tables B 2.3.5**. The yield levels recorded are summarized below.

**Table B 2.3.6 Summary of Paddy Yield**

(Unit: ton/ha)

Source	Nachchaduwa		Rajangana		Thuruwila	
	Maha	Yala	Maha	Yala	Maha	Yala
IE Office DOI	4.88	4.11	4.73	4.40		
GAP/INMAS	5.98	4.76	5.78	5.00		
FO Survey	4.12	4.12	4.33	4.33		
Socio-economic Survey	4.85	4.76	5.20	5.40	4.22	4.20

Sources: IEs Office, Nachchaduwa and Rajangana, DOI  
Department of Census and Statistics  
Central DOA, Field Surveys of JICA Study Team

The GAP/INMAS yield data given above are for the demonstration areas and may not truly represent the general yield for the entire area. Based on the available data on paddy production and yield, and through discussions with relevant officials from IP DOA, PDOA and Department of Census and Statistics (Anuradhapura), the average paddy yield for the Study area is estimated to be in the range of 4.7 – 5 t/ha.

### 2.3.3 Crop Production Practices

#### (1) Paddy

Data and information to grasp the present conditions with regard to cropping practices were collected through 3 group interviews carried out in each of the pilot area studied. Due to limited time the farmers could spare for these discussions, each session had to be confined to 2 – 3 hours. Information was collected verbally following a semi-structured questionnaire designed for the purpose. The questionnaire used is given in **Attachment B 2**.

**Table B 2.3.1 Summary of Kanna Meetings: Crop Calendar**

Nachchaduwa: Maha Season

Item	2005/06	2005/04	2003/04	2002/03	2001/02
1 Cultivation area (ha)	2,800	-	1504	2,800	2,800
2 Paddy (ha)					
3 Varieties (duration months)	3.0 - 3.5	-	3.0 - 3.5	3.0 - 3.5	3.5 - 4.0
4 OFC (ha)					
5 Final date for clearing bunds and canals	25.10.05	-	26.11.03	31.10.02	20.10.01
6 Water issue for land preparation	01.11.05	-	25.11.03	01.11.02	01.11.01
7 Last date for sowing	25.11.05	-	15.12.03	25.11.02	30.11.01
8 Last date for planting OFC			10.01.04		
9 Last date to pay insurance premium	25.11.05	-	15.12.03	28.11.02	30.11.01
10 Removing cattle/tractors from tract	25.11.05	-	05.12.03	25.11.02	30.11.01
11 Starting date of water rotations	15.12.05	-	22.12.03	10.12.02	15.12.01
12 Last date of water rotations	25.02.06	-	22.03.04		15.03.02
13 Last date to notify crop damage	25.02.06	-		25.03.03	15.03.02
14 Commence harvesting	01.03.06	-	01.04.04		
15 Complete harvesting	31.03.06	-	20.04.04	31.03.03	01.04.02
16 Letting cattle into the tract	31.03.06	-	30.04.04	10.03.03	
17 Fine for not clearing canals					
Field canal Rs/2m	100	-	100	100	
Distributary canal Rs/2m	150	-	100	100	
18 Contribution: Agrarian Services Fund	20kg/.4ha	-	10kg/.4ha	10kg/.4ha	10kg/.4ha

Nachchaduwa: Yala Season

Item	2005	2004	2003	2002	2001
1 Cultivation area (ha)	2,800		2,800	1,070	1,000
2 Paddy	1,400		2,100	110	
3 Paddy Varieties (duration in months)	3.0 - 3.5	3-3.5	3.0 - 3.5	3.0 - 3.5	3.5 - 4.0
4 OFC	1,400		700	960	
5 Final date for clearing bunds and canals			17.04.03	10.05.02	27.04.01
6 Water issue for land preparation	18.04.05	21.05.04	18.04.03		01.05.01
7 Last date for sowing	08.05.05	05.06.04	12.05.03	05.06.02	15.05.01
8 Last date for planting OFC					
9 Last date to pay insurance premium	25.04.05	05.06.04	12.05.03	05.06.02	15.05.01
10 Removing cattle/tractors from tract	26.04.05	05.06.04	12.05.03	05.06.02	16.05.01
11 Starting date of water rotations	04.05.05	10.06.04	18.04.03		20.05.01
12 Last date of water rotations	25.07.05	08.09.04	12.08.03		10.08.01
13 Last date to notify crop damage	25.07.05	20.09.04	12.08.03	05.09.02	10.08.01
14 Commence harvesting		20.09.04			
15 Complete harvesting	28.08.05	30.09.04	15.09.03	25.09.02	10.09.01
16 Letting cattle into the tract	26.07.05		25.08.03		
17 Fine for not clearing canals					
Field canal Rs/2m	100	100	100	100	75
Distributary canal Rs/2m	150	100	100	100	100
18 Contribution: Salaris to FO	20kg/.4ha	10kg/.4ha	10kg/.4ha	R.100/.4ha	

Source: Minutes of the Cultivation Meetings Nachchaduwa DS Division

Rajangana: Maha Season

Item	2005/06	2004/05	2003/04	2002/03	2001/02
1 Cultivation area (ha)	6,200	6,200	6,200	6,200	6,200
2 Paddy	4,440	4440	4,440	4440	4440
3 Paddy Varieties (duration in months)	3-3.5-4	3-3.5	3-3.5	3.5-4	3-3.5
4 OFC	1,760	1760	1760	1760	1760
5 Final date for clearing bunds and canals	05.10.05	15.10.04	30.09.03	01.10.02	30.10.01
6 Water issue for land preparation	05.10.05	25.10.04	15.01.03	07.10.02	05.11.01
7 Last date for sowing	01.11.05	25.11.04	10.11.03	30.10.02	26.11.01
8 Last date for planting OFC					
9 Last date to pay insurance premium		25.11.04			26.11.01
10 Removing cattle/tractors from tract	01.11.05	25.11.04	10.10.03	30.10.02	26.11.01
11 Starting date of water rotations		16.12.05			
12 Last date of water rotations	05.03.06	02.03.05		24.02.03	01.03.02
13 Last date to notify crop damage		20.02.05		14.02.03	26.02.02
14 Commence harvesting	01.03.06	06.03.05			
15 Complete harvesting	01.04.06			05.03.03	10.03.02
16 Letting cattle into the tract	01.04.06	15.04.05	31.03.04	07.10.03	05.11.01
17 Fine for not clearing canals					
Field canal Rs/2m	50	25	50	25	25
Distributary canal Rs/2m	500	200	100	200(per day)	200(per day)
18 Contribution: Salaris to FO	10kg/.4ha	10kg/.4ha		10kg/.4ha	10kg/.4ha

Rajangana: Yala Season

Item	2005 Yala	2004 Yala	2003 Yala	2002 Yala	2001 Yala
1 Cultivation area (ha)	6,200	-	6,200	6,200	6,200
2 Paddy	4,440		4,440	4440	4440
3 Paddy Varieties (duration in months)	3-3.5	-	3-3.5	3-3.5	3-3.5
4 OFC	1,760	-	1760	1760	1760
5 Final date for clearing bunds and canals	10.04.05	-	10.03.03	10.04.02	17.04.01
6 Water issue for land preparation	10.04.05	-	15.03.03	15.04.02	21.04.01
7 Last date for sowing	15.05.05	-	10.04.03	15.05.02	20.05.01
8 Last date for planting OFC					
9 Last date to pay insurance premium	15.05.05	-	10.04.03	15.05.02	20.05.01
10 Removing cattle/tractors from tract	15.05.05	-	10.04.03	15.05.02	20.05.01
11 Starting date of water rotations	22.05.05	-			20.04.01
12 Last date of water rotations	15.08.05	-		15.08.02	20.08.01
13 Last date to notify crop damage	25.08.05	-	15.06.03	26.07.02	20.08.01
14 Commence harvesting	15.08.05	-			
15 Complete harvesting	15.09.05	-	30.07.03	05.09.02	30.09.01
16 Letting cattle into the tract			15.03.03	15.04.02	20.04.01
17 Fine for not clearing canals					
Field canal Rs/2m	25	-	25	25	25
Distributary canal Rs/2m	250	-	200	200	200(per day)
18 Contribution: Salaris to FO	10kg/.4ha	-	100/ha or .5bu	10kg/.4ha	100/ha

Source: Minutes of the Cultivation Meetings Rajangana RPM Office

**Table B 2.3.2 Paddy Production Data of Study Area**

**Nachchaduwa**

Maha	Extent (ha)	Production (t)	Yield (t/ha)
97/98			
98/99	2,510	11,069	4.41
99/00	2,510	11,320	4.51
00/01	2,510	12,600	5.02
01/02	2,510	14,985	5.97
02/03	2,510	11,320	4.51
03/04	2,800	13,496	4.82
04/05	2,800	13,776	4.92
<b>Total</b>	<b>18,150</b>	<b>88,566</b>	
<b>Average</b>			<b>4.88</b>

Yala	Extent (ha)	Production (t)	Yield (t/ha)
1998	1,472	5,741	3.90
1999	2,462	10,464	4.25
2000	2,510	10,668	4.25
2001	941	4,291	4.56
2002	992	4,276	4.31
2003	2,800	11,060	3.95
2004	128		
	<b>11,305</b>	<b>46,498</b>	
			<b>4.11</b>

**Rajangana**

Maha	Extent (ha)	Production (t)	Yield (t/ha)
97/98	5,459	23,637	4.33
98/99	6,000	28,320	4.72
99/00	6,000	27,000	4.50
00/01	5,457	28,267	5.18
01/02	5,610	27,826	4.96
02/03	5,610	26,479	4.72
03/04			
04/05			
<b>Total</b>	<b>34,136</b>	<b>161,530</b>	
<b>Average</b>			<b>4.73</b>

Yala	Extent (ha)	Production (t)	Yield (t/ha)
1998	6,280	25,748	4.10
1999	6,000	26,280	4.38
2000	5,457	23,574	4.32
2001	4,080	19,339	4.74
2002	6,229	28,467	4.57
	<b>28,046</b>	<b>123,408</b>	
			<b>4.40</b>

Source:Nachchaduwa and Rajangana IE's Offices, ID

**Table B 2.3.3 Paddy Statistics - Major Irrigation Projects Under GAP**

**Anuradhapura District**

Season	Project	Yield (kg/h) (nett)	Yield (bu/ac) (nett)	Std.Error	95% Confidence Limit	
					Lower	Upper
03/04 Maha	Huruluwewa	4,744		501	3,762	5,726
	Mahakandarawa	4,014		214	3,595	4,433
	Mahawilachchiya	4,209		261	3,697	4,720
	Nachchaduwa	5,986		72	5,844	6,127
	Nuwarawewa	6,347		54	6,237	6,451
	Padaviya	5,429		152	5,131	5,725
	Rajangana	5,780		308	5,175	6,383
	Tissawewa	6,100		232	5,647	6,555
	Wahalkada	6,332		523	5,308	7,357
03 Yala	Huruluwewa	3,196	62.37	7.44	47.79	76.95
	Mahakandarawa	4,271	83.34	4.48	74.56	92.12
	Mahawilachchiya	4,492	87.64	2.44	82.86	92.42
	Nachchaduwa	4,999	97.55	12.89	72.29	122.81
	Nuwarawewa	5,368	104.75	8.98	87.15	122.35
	Padaviya	4,621	90.17	4.12	82.09	98.35
	Rajangana	4,918	95.96	6.75	82.73	109.19
	Tissawewa	4,813	93.91	4.87	84.36	103.46
	Wahalkada	5,171	100.90	8.08	85.06	116.74
05 Yala	Rajangana RB	4,585		282	4,033	5,137
	Rajangana LB	5,563		623	4,344	6,786
	Nachchaduwa	4,527		249	4,039	5,015
	Wahalkada	4,286		332	3,634	4,937
	Padaviya	5,280		71	5,141	5,418
	Huruluwewa	4,649		6	4,636	4,661
	Manankattiya	4,148		8	4,133	4,163
	Nuwarawewa	5,408		427	4,572	6,246

Source: Department of Census and Statistics, DOA



**Table B 2.3.4 Paddy Production Data by Farmers' Organizations**

**Nachchaduwa**

FO Name	02/03 Maha			03 Yala			03/04 Maha		
	Extent (ha)	Production (t)	Yield (t/ha)	Extent (ha)	Production (t)	Yield (t/ha)	Extent (ha)	Production (t)	Yield (t/ha)
Senasamagi	164	674	4.1	164	590	3.6	164	337	2.1
Mahasen	200	871	4.4	158	567	3.6	200	264	1.3
Parakumba	144	517	3.6	144	517	3.6	144	516	3.6
Navoda	80	288	3.6	80	288	3.6	80	209	2.6
Ranketha	234	958	4.1	219	1013	4.6	234	227	1.0
FO: 26/27	204	838	4.1	204	732	3.6	200	0	0.0
Ruwanveli	230	1178	5.1	216	868	4.0	230	222	1.0
Tissa	250	1026	4.1	180	462	2.6	250	0	0.0
Eksath	159	641	4.0	159	641	4.0	159	640	4.0
Isuru	141	543	3.9	141	435	3.1	141	543	3.9
Ranamaura	148	608	4.1	113	406	3.6	148	374	2.5
Gemunu	297	989	3.3	190	710	3.7	259	1064	4.1
Wijaya	96	543	5.7	96	494	5.1	96	494	5.1
<b>Total</b>	<b>2347</b>	<b>9674</b>	<b>4.1</b>	<b>1900</b>	<b>7723</b>	<b>4.1</b>	<b>2305</b>	<b>4890</b>	<b>2.1</b>

**Rajangana**

FO Name	02/03 Maha						03/04 Maha			04 Yala		
	Extent (ha)	Production (t)	Yield (t/ha)				Extent (ha)	Production (t)	Yield (t/ha)	Extent (ha)	Production (t)	Yield (t/ha)
Sri Udara	139	666	4.8	-	-	-	139	713	5.1	139	773	5.6
Parakum	195	498	2.6	-	-	-	194	897	4.6	194	996	5.1
Sadagala	149	537	3.6	-	-	-	149	572	3.8	149	610	4.1
Saliyagama	156	801	5.1	-	-	-	134	689	5.1	134	659	4.9
Mahasen	159	779	4.9	-	-	-	159	783	4.9	159	721	4.5
Wijaya	165	633	3.8	-	-	-	165	676	4.1	165	591	3.6
<b>Total</b>	<b>963</b>	<b>3914</b>	<b>4.1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>940</b>	<b>4330</b>	<b>4.6</b>	<b>940</b>	<b>4350</b>	<b>4.6</b>

**Table B 2.3.5 Paddy production Data in Pilot Area**

Scheme/FO	Season	Extent (ha)	Production (t)	Yield (t/ha)
Nachchaduwa	04/05Maha	22.8	110.6	4.85
Isuru	05Yala	24.3	115.6	4.76
Thuruwila	04/05Maha	26.4	137.3	5.20
Mahanama	05Yala	25.2	136.1	5.40
Rajangana	04/05Maha	27.7	116.9	4.22
Sri Udara	05Yala	25.5	107.1	4.20

Source: Survey of FOs, JICA Study Team

#### a) Seed Paddy

Samba rice varieties, Bg 450 and Bg 358, nadu variety Bg 359 and a unregistered variety known as pokuru samba are most commonly cultivated in the Naha season, and during the Yala, short aged Bg 300, Bg 352 and, where early sowing is possible, pokuru samba are the preferred varieties. Farmers usually replaced their own seed stock with improved seeds, either certified or secondary, once every 3 – 4 seasons. Self seed production practice, however, is not well organized. Farmers did not maintain special 'liyadda' or plot reserved for production of seeds for next season, nor did they make a concerted effort to separate out the seeds at the time of threshing and to store it separately under the proper conditions. Certified seeds are supplied mainly by the private sector which included the Ceylon Industrial Chemicals Ltd., and Isuru Seed Production Co. Ltd., a private farmers company in Tract 4 in the Rajangana Scheme.

The price per 20.50 kg standard bag of certified seed paddy ranged between Rs. 630 – 675. Non availability of required seed varieties at the proper time and quantity was one of the problems identified by the farmers.

Pokuru samba, a 4 – 4.5 month unregistered variety, is the main variety grown in the pilot areas of Nachchaduwa (60%) and Thuruwila (70), and to a lesser extent in Rajangana, during the Maha season. The variety is apparently a test line released by DOA for field adaptive trials and has spread out to the region. Farmers who cultivated this variety maintained that it compared well with other recommended paddy varieties in terms of unit yield and pest resistance. Most importantly, its superior grain characteristics gave a ready marketability as well as a premium price.

#### b) Land Preparation

Land preparation work always started after the commencement of the water issues, as the farmers felt that the rains are not dependable even in the Maha season. The first operation is to impound water and keeping the fields inundated for 2 – 3 days. This requires 1 – 3 man days. Cleaning the bunds may start before or after the plowing. It needs 4 – 5 man days. Plowing the land in the pilot area is almost entirely done with 2 wheel tractors using rotorvaters. The method gives a tillage depth of about 10 – 14 cm. Usually 2 plowings, 6 – 10 days apart is sufficient, but some fields may require a third plowing as observed in Nachchaduwa and Thuruwila. Here, the 3ed plowing may take place 5 – 20 days after the first. In Rajangana, field leveling is often carried out using leveling board drawn by 2 wheel tractor or buffalos. 5 liters of diesel fuel is consumed by the tractor to plough twice 0.4 ha of land and if hired, Rs. 4,000 is charged for the same land extent. An additional man day per operation, usually the farmer is also required for work supervision. Reshaping/plastering of the bunds commences the following day, and about 4 man days are required to complete the work. The field is then leveled by either 2 wheel tractor or by cattle drawing a leveling board. Hiring cost for either operation is Rs. 1,000 per 0.4 ha. Immediately

before sowing, the final seed bed is prepared by making shallow surface drains, called 'elawal thebeema', for which one man day is used per 0.4 ha.

In the first plowing operation, soil penetration to a depth of 20 – 25 cm using either mould-board or disc plough is required to provide the best conditions for root growth and to bury the weed seeds deep enough to prevent them from germinating. The main reasons for not practicing deep tillage are, 1) lack of draft power (4 wheel tractors), 2) lack of proper implements, and 3) higher cost involved.

#### c) Seed Preparation

Paddy seeds are pre-germinated prior to sowing. The seeds in poly-woven bags are kept immersed in water for 3 days during the day time but removed for the night time to drain out the water during the night. On the 4th day, the seeds are sufficiently pre-germinated for sowing. Immersing the seeds continuously for 2 days is also practiced. In Nachchaduwa and Thuruwila, the seed paddy in poly-bags are sometimes immersed in water continuously for 2 days, and allowed to drain out for 2 – 3 days, turning the bag on its flat side twice daily. An alternative, but less common practice in Rajangana is to spread the wetted seeds on a mat or polythene and keeping it covered with gunnies for 3 days before sowing. The process is locally known as 'yahan kireena'

#### d) Crop Establishment

The seed rate depended on the variety used and the method of crop establishment. Over 98% of the farmers in the pilot area used broadcast sowing method for crop establishment. Transplanting has declined over the years due to shortage of transplanting labour and the increasing costs. The practice is now more or less restricted to very small holdings and to fill gaps in washed off areas in the field. For direct sowing, 100 kg of seeds per ha are used for samba type paddy varieties while 110 - 130 kg are used with nadu types to account for variation in seed count per kg in the variety. For transplanting, in rare occasions where the method is practiced, seedlings are raised in a nursery with half the quantity of seeds for 14 days prior to uprooting for field planting.

Three days after broadcasting, the plot or liyadda is impounded with water to a depth of 4 cm for one day before draining out, the process known locally as 'isnan heraweema'.

#### e) Plant Nutrition

Only about 15 - 20% of the farmers in the area used the straw from previous crop to enrich the organic matter content of the soil. The straw from the threshing floor is transported back to the field and kept as small heaps. It is usually added to the field after the first plough, but sometimes mixed with soil after the final plowing operation. The respondents in Nachchaduwa noted that lessees and tenant farmers had no interest on the soil improvement as the benefits accrued will be on the long term. In

Rajangana, it was pointed out that some farmers who resided outside the pilot area, particularly those from Giribewa village, tended to burn the straw at the end of the season before returning to their homes. Most of these farmers visited the paddy fields only for the cultivation period and they operated on other lands outside the project area as well. Some farmers considered that straw incorporation involved additional work and it also interfered with plowing operation. The practice is made compulsory in the yaya or tract demonstrations under GAP program organized by the field extension staff and in one acre maximum yield demonstrations where green manure, chicken manure and sometimes husk charcoal too were added.

Less than 50% of the farmers applied basal fertilizer, either as V1 mixture or as self made mixture from straight fertilizers (N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O-Zinc). Farmers in Nachchaduwa sometimes added kieserite and Zinc sulphate with the basal. Basal fertilizer is incorporated to the soil at the puddling stage before sowing. A 50 kg standard bag of the mixture cost the farmer Rs. 1525.

Booster dose of urea at the rate of 50 - 100 kg per 0.4 ha is applied as split doses to the field at 14 – 21 DAS by all farmers. Urea is supplied by the ASC at Rs. 575 per 50 kg bag and at Rs. 585 by private sources.

Top dressing mixture (TDM) is added at the rate of 50 kg per 0.4 ha to short aged and long aged varieties 45 DAS and 55 – 60 DAS, respectively. About 70 -80% of the farmers used TDM at a cost of Rs. 950 per 50 kg bag. Some farmers preferred to use a self made mixture of 50 kg of urea and 10 – 15 kg of Muriate of Potash (MOP) to apply as TDM. In general the farmers were unable to recall the fertilizer recommendations based on the yield basis, and tended to apply an unbalanced dosage. In Nachchaduwa where high usage of fertilizer is practiced, disproportionately high urea application was observed. Use of basal, the most expensive of the mixtures, was used at about 50% of the recommended dosage level. Except for demonstration tracts, individual or farmer groups did not avail themselves of the service available from the DOA for fertilizer recommendations based on soil analysis. An effort on the part of extension is required to organize such soil testing programs on tract or FO basis.

#### f) Weed Management

Since transplanting is not practiced, farmers have to depend on herbicides to control weeds in the field. There are several practices that the farmers can adopt to keep weed growth to a minimum. These include 1) keeping the bunds, canals and drains free of weeds, 2) using good quality seed material, and 3) preventing contamination of weed seeds by not washing seed paddy in canal water. In the field observations, it was noticed that such practices are rarely followed.

All farmers used herbicides for control of weeds. 75% of the farmers in Nachchaduwa and some in Thuruwila and Rajangana applied total weed killers, glyphosate or paraquat, to the field and bunds prior to commencement of land preparation. Farmers said that the need for pre-emergence herbicides could be

minimized or avoided altogether by this method. 3-4DPA and MCPA are commonly used as pre-emergence herbicides. In addition, weed specific or selective herbicides are sometimes applied as required. Herbicides are generally applied between 7 and 28 DAS at least once. If applied early, a single application at the rate of 1 -2 l. per 0.4 ha has given satisfactory results. Depending on nature of weeds and how late the herbicides are applied, the concentration and number of applications is increased. On average 2 applications are made by the farmers. A variety of commercial products are used by the farmers and the prices range between Rs. 500 – 700 per liter. Some farmers believed that application of Hedonal M50 promoted tillering

#### g) Pest and Disease Management

Pest incidence and degree of crop damage varied widely, and in some Maha seasons, control measures were not required at all. However, in general, a single application of insecticides gave satisfactory control of the common insect pests. Disease problems were relatively low in the area. Pesticides were applied by farmers as a routine measure even when sufficient build up of pest population and economic crop damage levels were not observed. As the field visits of the AIs are restricted due to transport difficulties, the farmers often tended to consult the agrochemical dealers for pesticide recommendations. Fraudulent labeling of agrochemical packaging giving incorrect information on the date of expiry and concentrations of the active ingredients was a issue raised by farmers in Nachchaduwa and Rajangana.

Farmers were of the opinion that the practice of Integrated Pest Management (IPM) was not always practical as the yaya or tract operations could not be adequately synchronized due to shortage of farm machinery and labour as well as the shortcomings in the irrigation infrastructure. Even in areas where tract demonstrations had been conducted successfully, little follow-up action has been carried out to ensure continuation of the practices introduced resulting in poor adoption rates.

#### h) Harvesting and Threshing

The ideal time to harvest the crop is when 85% of the panicles turn golden yellow, the moisture content is about 22%, and dry weather conditions persists. However, on account of difficulties of making contract arrangements for reaping and threshing, the operation may not be possible at the proper time. Reaping is done manually, and over 20 labour units are required per hectare. In the Study area, particularly in Nachchaduwa and Thuruwila, where farm labour is in short supply, contract harvesting is the common practice. The harvested paddy is carried to the threshing floors and heaped for threshing. A common threshing floor, located in one farmer's field, is shared by several farmers.

Three methods are used for threshing in the Study area. The 4 wheel tractor which was popular at one time is gradually being replaced by 2 wheel tractor driven small capacity thresher units. The high capacity combine thresher, which is a recent

introduction to the area, has gained wide acceptance among farmers, particularly in Nachchaduwa and Thuruwila. About 12 units are in the area. In Rajangana, the 2 units are in operation and the method is becoming popular. Cost of threshing by the 3 methods is about the same, but the high capacity units are preferred by farmers as it gives good clean seeds (separate winnowing operation as in other methods is not required), needs less labour for the operation (operation is done on contract basis inclusive of labour) and the operation is fast (about 4 hours per ha). It also gives chopped straw which is more convenient to add back to the paddy field for soil enrichment.

i) Post-Harvest

Farmers tend to omit field drying of the harvested paddy prior to threshing. The first stage of drying is done by laying the reaped panicles. This is done mainly to supply the product to the market quickly and early in order to take advantage of the generally high prices that prevail at the commencement of harvest season. Another factor is the logistics of hiring the high capacity harvester at the same time as the other farmers in the tract or yaya. Proper drying of the threshed paddy to a moisture level of 12 – 13% is important for both storage and marketing. Paddy with high moisture content supplied for sale is often rejected by institutional buyers (ASCs) or by established private buyers (large rice millers).

The costs of production of paddy at the three pilot locations are shown in the **Table 2.3.7**.

Table B 2.3.7

## COST OF PRODUCTION OF PADDY - NACHCHADUWA-

Operation	Material					Machinery				Labour (Mandays)			Total cost/ha (Rs/ha)
	Type	Unit	Rate	Qty/ha	Cost/ha	Unit	Qty/ha	Rate	Cost/ha	Rate	Qty	Cost/ha	
<b>1.Land Preparation</b>													
Cleaning of bunds	H'cide	l	520	2.5	1300					450	2	900	2200
Ploughing						times	2	3543.5	7087	400	1	400	7487
Reshaping & plastering										400	8	3200	3200
<b>2.Crop Establishment</b>													
Seed, bed Preparation & sowing	Seeds	kg	28	102	2856					400	10	4000	6856
<b>3.Fertilizer Application</b>													
Basal Dressing	V1	kg	32	100	3200					400	1	400	3600
14 DAS	Urea	kg	13	62	806					400	1	400	1206
30 DAS	Urea	kg	13	125	1625					400	1	400	2025
45-50 DAS	TDM	kg	18	105	1890					400	1	400	2290
<b>4.Weed control</b>													
	H'cide	l	520	4	2080					450	2	900	2980
<b>5.P&amp;D control</b>													
	P'cide	l	520	2.5	1300					450	1	450	1750
<b>6.Irrigation</b>													
										400	20	8000	8000
<b>7.Harvesting</b>													
										400	1	350	350
										Labor contract		10000	10000
<b>8.Threshing</b>													
						Contract:H/C thresher			6250				6250
<b>9.Transport</b>													
	Bags	No	8	100	800	Tractor & trailer			500	400	2	800	2100
<b>Total Without FL</b>					14557				13837		51	30600	58994
<b>Total with FL</b>					14557				13837	350	32	21200	49594

Source: Socio-Economic Survey, JICA Study Team

Table B 2.3.7

## COST OF PRODUCTION OF PADDY- THURUWILA-

Operation	Material					Machinery				Labour (Mandays)			Total cost/ha (Rs/ha)
	Type	Unit	Rate	Qty/ha	Cost/ha	Unit	Qty/ha	Rate	Cost/ha	Rate	Qty	Cost/ha	
<b>1.Land Preparation</b>													
Cleaning of bunds										350	2	700	700
Ploughing						times	2	3106	6212	350	1	350	6562
Reshaping & plastering										350	8	2800	2800
<b>2.Crop Establishment</b>													
Seed, bed Preparation & sowing	Seeds	kg	29	103	2987					350	10	3500	6487
<b>3.Fertilizer Application</b>													
Basal Dressing	V1	kg	32	62	1984					350	1	350	2334
14 DAS	Urea	kg	13	62	806					350	1	350	1156
30 DAS	Urea	kg	13	87	1131					350	1	350	1481
45-50 DAS	TDM	kg	18	88	1584					350	1	350	1934
<b>4.Weed control</b>													
H'cide	l		520	4	2080					350	2	700	2780
<b>5.P&amp;D control</b>													
P'cide	l		570	2.5	1425					350	1	350	1775
<b>6.Irrigation</b>													
										350	20	7000	7000
<b>7.Harvesting</b>													
										350	1	350	350
										Labor contract		7500	7500
<b>8.Threshing</b>													
													6250
<b>9.Transport</b>													
													1200
<b>Total Without FL</b>					11997				12962		51	25350	50309
<b>Total with FL</b>					11997				12962	350	26	16600	41559



Table B 2.3.7

## COST OF PRODUCTION OF PADDY - RAJANGANA-

Operation	Material					Machinery				Labour (Mandays)			Total cost/ha (Rs/ha)
	Type	Unit	Rate	Qty/ha	Cost/ha	Unit	Qty/ha	Rate	Cost/ha	Rate	Qty	Cost/ha	
<b>1.Land Preparation</b>													
Cleaning of bunds	H'cide	l	520	3	1560					350	3	1050	2610
Ploughing						times	2	3075	6150	350	1	350	6500
Reshaping & plastering										350	9	3150	3150
<b>2.Crop Establishment</b>													
Seed, bed Preparation & sowing	Seeds	kg	30	110	3300					350	6	2100	5400
<b>3.Fertilizer Application</b>													
<b>Basal Dressing</b>	V1	kg	32	63	2016					350	1	350	2366
14 DAS	Urea	kg	13	62	806					350	1	350	1156
30 DAS	Urea	kg	13	87	1131					350	1	350	1481
45-50 DAS	TDM	kg	18	44	792					350	1	350	1142
<b>4.Weed control</b>	H'cide	l	500	4	2000					350	1	350	2350
<b>5.P&amp;D control</b>	P'cide	l	550	2.5	1375					350	1	350	1725
<b>6.Irrigation</b>										350	20	7000	7000
<b>7.Harvesting</b>										350	23	8050	8050
<b>Threshing</b>								Contract:H/C thresher	6000	350	3	1050	7050
<b>8.Transport</b>	bags	No	8	100	800			Tractor & trailer	500	350	2	700	2000
<b>Total Without FL</b>					12220				12650		73	25550	50420
<b>Total with FL</b>					12220				12650	350	43	15050	39920

## (2) Vegetables

The most common vegetables cultivated in the irrigated lands are bitter gourd, snake gourd, eggplant, tomato, cucumber, sweet pumpkin and cabbage.

An innovative project for production of vegetables, initiated by eight brothers was in operation in the pilot area of Nachchaduwa. Prior to 1988, 15 members comprising the brothers, relatives and friends started cultivation of chilli and soybean in lands that were seasonally abandoned by their owners due to shortage of water in the Yala season.

The group was able to earn Rs. 300,000 per season, and the profits had been invested on purchase of additional agricultural land. However, they had been internally displaced during the civil riots that erupted in 1989 and lost all property and other possessions. They returned in 1994, and with funds provided by an outsider, raised 4 ha of egg plant and 10 ha of melon in lands that were not cultivated by their owners, either free of charge or on lease payment agreements.

The youth group, calling themselves the Krushiboga Nishpadana Samaithiya, was formed in 2003, with 22 members, which has now expanded to include 35 members cultivating 22 ha with traditionally upland vegetable crops such as bitter gourd, cabbage, tomato, eggplant, snake gourd and loofa. Selection of the crops is based on the demand and price behaviour in the market. Specialized and niche markets are particularly targeted. Except for eggplant and snake gourd, for which the seeds are self produced or locally procured, imported hybrid seeds purchased from a Colombo based seed importer are used. This ensures product superiority and high yield levels compared to other farmers who are growing the same crops. Recruitment of new members to the group is determined by the genuine interest and ability to work, contribution to the group land resource (own or leased) and ability to supply of labour. The land is jointly cultivated, and the more experienced members are allocated larger holdings to operate.

The family owns 2.8 ha and the rest of the land is leased from farmers for a period of one year. In selecting land, preference is given to those located below small tanks where the available seepage water minimizes the irrigation needs. Soil is improved by incorporating 1.5 cubes of cow dung (7 truck loads at Rs. 2000 each) and straw from 0.8 ha paddy for every 0.4 ha cultivated and drainage is improved by cutting 0.5 – 0.8 m deep drains using back-hoe machine. Agro-wells are dug where necessary, to facilitate irrigation between the seasons when irrigation water issues from the reservoirs are stopped.

Crops such as cabbage, tomato and eggplant are direct seeded in the field to cut down cost of nursery establishment and also to enable timely planting to minimize rain damage. Bitter gourd, snake gourd and loofa are sometimes raised in polythene tubes in a nursery. Mixed cropping and relay cropping with 2 crops is the most common practice where crops occupy different canopies. The climbers occupy the horizontal trellis made of coir rope mesh spaced 0.3 x 0.3 m which is supported on 2.5 m high end-support poles planted at 3 – 5 m square. Individual climber is trained to the mesh using poles.

Cropping is not confined to seasons but continued throughout the year and 2 – 3 crops are raised in one year. The crop duration depended on the number of pickings per harvest as determined by factors such as weather, market situation and the cost benefits. In the case of cucurbitaceous plants and egg plant, the harvesting period is extended by continuing fertilizing and irrigation sometimes as long as 7 months. The intercrop is introduced during the late stage of harvesting when more light penetration takes place through the drying canopy. By adopting these methods, the cropping intensity of the lands has been vastly increased.

The group has purchased a truck on a loan granted by the Bank of Ceylon, for transportation of the produce to the Dambulla market. One truck load collected from the members is dispatched daily. Since the production techniques adopted by the group ensures continuity of production and crop specialization, they have been able to establish and maintain good working relationships with few regular wholesale buyers in the Dambulla market.

Because of the high investments on annual land improvement and inputs, the cost of production remained in excess of Rs. 100,000 per 0.4 ha per crop. About 40 units of hired labour are used and paid at the rates of Rs. 250 plus meal per female and Rs. 300 plus meal per female on a continuous basis. The group members are paid a minimum of Rs. 20,000 – 25,000 per month each, and the amount increased with the area operated by individual member.

The group has also diversified their activities by undertaking a contract work for rehabilitation of 2 minor tanks, Kaluwila and Madawelagama, from Irrigation Management Division. The contract works valued at Rs. 1.8 million has been completed.

Bank of Ceylon, impressed by the achievements the youth group, had granted one year loan amounting to Rs. 1 million in December, 2004 (Rs. 50,000 for each of the 10 members at the time) which they had used to purchase the truck. The total loan had been paid up in 6 months. In May 2005, the Bank issued a fresh loan of Rs. 1.8 million (Rs. 75,000 to each of 24 members) and later additional amount of Rs. 300,000 to four new members in November, 2005.

The management functions of the group are divided among three brothers, each responsible for (a) production technology, (b) accounting and group cohesion and (c) public relations with farmers in the area, organizations and institutes, etc.

Some of the major issues confronting the group were highlighted at the discussion and are listed below.

a) Recognition

The group exists as an informal society as all concerned government organizations have so far refused to give it official recognition.

b) Land

Suitable lands for growing vegetables are becoming scarce due to a number of reasons.

- i) Land owners are reluctant to lease out land to the group as they fear that the group may develop a land claim on the long term.
  - ii) Some farmers object to cutting deep drainage canals in the paddy fields even though they are refilled at the time of handing over and the land is enriched with addition of organic manure.
  - iii) Some farmers seeing the successful vegetable crops raised by the group started their own vegetable cultivation creating a market competition at the local level.
- c) Technology

The hired labourers sometimes leave the group to work on their own or under other land owners to apply the production practices and the technologies learned. This has created a drain of trained labour.

d) Marketing

Although good relations have been established with the regular wholesalers, there is always the possibility of over production when the demand is low resulting in the collapse of the price structure. The group is much concerned about the entry of new producers without proper planning as it could upset the existing supply demand balance at Dambulla market. In order to avoid such a situation, the group is planning for crop diversification to include cauliflower, capsicum and fruits like pomegranate in the current season. Further the group anticipates to entering into forward contracts with buyers for production of specialty crops including rare and traditional varieties of rice.

Good packaging of the produce was essential to minimize the wastage. However, the plastic containers available in the market are expensive (Rs. 1,500 per container), and therefore, their use is uneconomical. The group is currently discussing with the wholesale buyers the possibility of recycling the containers so that the packing costs could be reduced.

The yield data per ha, highlighted at the discussion, are summarized below.

**Table B 2.3.8 Yield of Some Vegetables**

(Unit: ton/ha)

	Crop	No of Picks	Yield/Pick (kg)	Yield/Crop	Av. Price Rs.
Cabbage	1	35,000	35,000	15	525,000
Eggplant	13	1,500	19,500	15	292,500
Bitter gourd	16	1,600	25,600	20	512,000
Snake gourd	24	1,300	31,200	10	312,000
Loofa	18	1500	27,000	15	405,000
Tomato	12	2000	24,000	17	408,000

Source: Interview Survey, JICA Study Team, 2005

### (3) Other Field Crops and Fruits

Production of pulse and cereal crops, except for some maize in the irrigated areas, is very limited. These crops are grown mainly under rainfed conditions in highlands during the Maha season and under minor tanks in the Yala season. Banana and papaya are the fruit crops seen in the irrigated lands. Banana is the favoured fruit crop and the extent appears to be increasing, particularly in Nachchaduwa and Rajangana. However, crop diversification has not shown a significant increase probably because of the legal restrictions against cultivation of crops other than paddy in the irrigated paddy lands.

The soil survey conducted in the 3 pilot areas shows that a substantial proportion of the irrigated paddy lands consist of well to imperfectly drained Reddish Brown Earths, which may be better suited for high value crops other than paddy. Thus, in terms of land suitability, there is a high potential for crop diversification as a means of improving farm income.

### (4) Home-gardens

As evident from the socio-economic survey carried out in the pilot areas, the size of the home gardens averaged to 0.4 ha in Nachchaduwa and 0.3 ha in Thuruwila and Rajangana. The potential for expansion of the OFCs cultivation in home garden is highly restricted due to spatial limitations. Besides the house, the land is largely occupied by a variety of perennial tree crops. Small patches of land near the house are usually planted with few vegetables, pulses or flowering plants.

**Table B 2.3.9 Perennial Tree Crops in Home Gardens**

(Unit: Nos)

Tree Crop	Nachchaduwa	Thuruwila	Rajangana
Coconut	20	13	15
Banana	11	12	11
Neem	5	5	6
Teak	4	3	8
Jack	3	2	1
Other	16	12	10
Total	59	47	51

Source: Socio-Economic Survey, JICA Study Team-2005

The density of tree population is very high compared to the average size of the home garden. The tree crops categorized under others included fruit crops such as mango, pomegranate, guava, citrus/lime, orange, cashew, etc., and timber crops such as halmilla, burutha, etc. In general the gardens are planted without a proper plan, except for the timber trees which are established along the fences. The products of home garden, fruits, vegetables, OFCs, etc., are largely for home consumption. However, there were some farmers in all three areas surveyed who obtained substantial incomes from coconut and banana.

## 2.4 Agricultural Credit

Agricultural credit supply sources available to farmers can be grouped into three categories as institutional, semi-institutional and non-institutional.

### 2.4.1 Institutional Credit

Disbursement of institutional credit as cultivation loans through government owned commercial banks commenced in 1967, under the New Agricultural Credit Scheme (NACS). The scheme was replaced first with the Comprehensive Rural Credit Scheme in 1974, and then with New Comprehensive Rural Credit Scheme (NCRCS) of 1978. Following credit scheme are currently in operation.

- NCRCS
- Forward Contract Sales Scheme (FSC)
- Paddy Pledge Loan Scheme
- Agricultural Machinery Loan Scheme

Cultivation loans of Rs. 18,000 per acre, subject to a maximum of 10 acres, are granted under the NCRCS at an annual interest rate of 8% for cultivation of irrigated paddy. Credit is disbursed in 2 – 3 installments and the payback period is set as 270 days. As main pre-conditions for granting loans, the applicant has to provide the bank with proof of land ownership and if not, certification as a farmer operator from the GN of the area as well as 2 personal guarantors or apply as a group of 3 farmers and crop insurance coverage. Crop insurance in the district is provided by the Crop Insurance Board and Ceylinco Insurance Co., a private institute that covers about 90% of the loans. Data on credit performance in the Study area are not available. Number of loans granted and the amount disbursed in Anuradhapura district by different banks is shown in **Table B 2.4.1**.

**Table B 2.4.1 Agricultural and Pledge Loans Granted in 2002 - 2004**

(Unit:Rs M)

Name of the Bank	Type of Loan	2002		2003		2004	
		No. of Loans	Amount Disbursed	No. of Loans	Amount Disbursed	No. of Loans	Amount Disbursed
Bank of Ceylon	Agriculture	4,923	140.0	15,561	468.1	2,580	80.0
	Pledge	26	21.8	165	548.0	63	580.0
People's Bank	Agriculture	875	15.7	11,468	83.8	7,180	35.5
				44	63.4	84	91.9
Hatton National Bank	Agriculture	385	26.8	385	26.8	616	40.9
	Pledge	1	0.4	1	0.4	1	3.0
Rajarata Development Bank	Agriculture	544	13.2	4,200	127.1	4,884	164.7
	Pledge	7	4.1	36	19.5	43	25.6
Seylan Bank	Agriculture	13	20.1	576	61.5	1,276	199.0
	Pledge	1	8.5	2	1.7	124	115.0
Sampath Bank	Agriculture	135	8.0	95	7.2	75	10.0
				3	19.2		
DFCC Bank	Agriculture	130	102.5	43	45.9	185	147.7
NDB	Agriculture	2	2.3	16	14.4	16	10.2
Samurdhi Bank	Agriculture	30,250	139.3	46,706	333.8	52,175	377.4
Cooperative Rural Bank	Agriculture	8,500	40.0	1,760	16.0	685	44.1
Sanasa Bank	Agriculture	3,247	16.0	3,205	15.1	2,981	14.8
Commercial Bank	Agriculture			1	0.6	1	0.6

Source: Central Bank, Anuradhapura

Based on the information gathered through problem analysis workshops and interviews with the farmers as well secondary data sources, the banks have not been able to bring about a significant improvement in the delivery and recovery of cultivation loans over the years. Some of the reasons attributed to the failure of institutional credit sources to establish stable relations, particularly with the small farmers are listed below.

- (1) Attitude of the rural community that institutional credit is like a government subsidy and that unpaid loans are likely to be written off by the government.
- (2) Bureaucratic procedures leading to non availability of credit in time.
- (3) Rigidity of rules, eg. collaterals.
- (4) High transaction cost, eg., banks located too far away.
- (5) Partial fulfillment of the farmers credit need.

#### 2.4.2 Semi Institutional Credit

The micro-financing institutions supported by the government, NGOs and CBOs and have come into existence since the 1980s can be grouped under the semi institutional category. It is expected that the major issues faced by the farmers with institutional sources can be solved by the micro financing institutions.

##### (1) Govijana Bank (GB)

GB was established in 1995, as a rural financial institution to achieve the objectives of providing credit facilities for agricultural production (as cash and material inputs) and for investment in agro-processing, storing and marketing ventures as well as for promoting

savings habit among small farmers.

The scheme is implemented by the DAD and GBs are established at each ASC to disburse credit to farmers through FOs. It seeks to enhance farmer participation in raising funds and also to manage and implement the credit scheme at grass-root level. The FO has to purchase a minimum of 50 shares of respective GB, at a share value of Rs. 100, in order to be a partner/shareholder of the bank. A farmer to benefit from the GB, he should: (i) be a member of the relevant FO, (ii) purchase a minimum of one share of the GB, and (iii) deposit Rs. 500 or 10% of the value of loan he expects to obtain from GB.

The capital funds of GB come from of savings and deposits of FOs and individual farmers and from allocations made by DAD. Credit performance of 2 GBs in the Study area are shown in **Table B 2.4.2**

**Table B 2.4.2 Credit Performance of Agrarian Bank**

Season	Saliya Asokapura				Nachchaduwa			
	Funds Disbursed (Rs)	No. of Farmers	Repayment (Rs)	Recovery (%)	Funds Disbursed (Rs)	No. of Farmers	Repayment (Rs)	Recovery (%)
1999/2000 Maha	691,083	116	691,083	100				
2000 Yala	611,290	88	605,177	99				
2000/2001 Maha	713,165	113	691,770	97				
2001 Yala	1,387,508	202	1,359,758	98				
2001/2002 Maha	1,998,966	281	1,978,976	99	1192553	175	1,192,553	100
2002 Yala	2,302,175	324	2,233,110	97				
2002/2003 Maha	3,513,039	446	3,091,474	88	1192553	267	1,192,553	100
2003 Yala	2,649,631	257	2,384,668	90	2450202	255	2,333,817	95.25
2003/2004 Maha	2,039,998	185	1,550,398	76	1547962.50	160	620,423	40.08
2004 Yala								
2004/2005 Maha	2,440,398	217			303275	28	232,369	76.62
2005 Yala	2,007,123	183			346830	32	328,101	94.60
2005/06 Maha					134904	18		

Source: Agrarian Bank, Saliya Asokapura and Nachchaduwa

### (2) Samurdhi Bank Society (SBS)

SBSs were setup as an integral part of the Samurdhi Movement and are involved in mobilizing savings from and granting loans to Samurdhi members. Loans are granted under several categories including cultivation, self employment projects, fisheries, housing etc. Cultivation loans cover mainly non paddy crops. In Nachchaduwa, Rs. 15, 996,776 have been disbursed among 2,047 as cultivation loans while in Rajangana RB area, Rs 14,540,500 have been disbursed among 2,952 farmers.

### (3) Cooperative Rural Bank (CRB)

CRB is the credit department of the Multi-purpose Cooperative Societies (MPCS) and functioned under the guidance of Peoples Bank in implementing the NACS and CRCS during the 1964 – 1992 period. In 1992, supervision of banking operations of CRBs in each district were brought under an apex body, the District Cooperative Rural Banking Union. The main activities of the CRBs include mobilization of savings, extension of credit, engaging in pawning activities, etc.



#### (4) Death Donation Societies (DDS)

The DDSs are CBOs that have emerged as a source of micro-credit supplying cultivation loans. Members are granted loans up to Rs 5000 per season at an interest rate of 5% per month. Although the interest rate is high, these loans are quite popular among farmers because of the quick access. DDSs are operating in all the three pilot areas.

#### 2.4.3 Non Institutional Credit

Non institutional credit is supplied by individuals in the community consisting of rich land owners, traders, industrialists (mill owners), tractors and machinery owners, local shop owners and sometimes even government servants residing in the area. The transaction between the money lender and the farmer (loan applicant) takes place on a personal level based on the lenders own assessment of the applicants creditworthiness. The conditions of the loan may demand collaterals (deeds, mortgages, valuables), agreement to purchase of inputs/sale of produce or both from/to the lender as is often the case with mill owner, shop owner, traders, etc. Farmers felt that such conditions placed them at a severe disadvantage. Private money lenders charge very high interest rates on cultivation loans to buffer the risks involved and also to take advantage of the high demand for credit. The annual interest rates may range from 60 to 150 percent.

#### 2.4.4 Credit Distribution in Pilot Areas

In the 3 FO areas surveyed, institutional credit remained the main supply source of agricultural credit. According to farmers the non institutional credit is on the decline in all the areas, while credit from semi-institutional sources is on the rise. The survey results revealed that 61%, 34%, and 45% of the farm operators from Nachchaduwa, Thuruwila and Rajangana, respectively, availed themselves of cultivation loans during the year 2005. The loans obtained by source in 2005 and the outstanding balance payments are shown below.

**Table B 2.4.3 Cultivation Loans in the Pilot Areas: 2005**

Survey Ares	No & (%) Recipients	Source Institutional	Semi Inst	Non Inst	Total Rs.	Outstanding Amt. Rs.
N'duwa	16 (61)	540,000	41,000	48,000	629,000	247,560
Th'wila	13 (34)	248,500	22,000	7,000	277,500	171,500
R'gana	14 (45)	200,000	25,000	8,000	233,000	238,738
Total		988,500	88,000	63,000	1,139,500	657,798
Percentage						

Source: Socio-economic Survey, JICA Study Team-2005

## Chapter 3      EXTENSION AND TRAINING

### 3.1      Extension

Extension in agriculture and related fields in the Study area are carried out by several agencies of both state and private sectors.

#### 3.1.1      Agriculture

Agricultural extension in the Study area comes under the purview of the central government through the inter-provincial DOA. The Study area is divided into 14 AI ranges under 3 ASC areas, 2 located in Rajangana Scheme at Rajangana and Saliya Asokapura and one in Nachchaduwa at Shrawastipura. The senior AIs in the ASCs, while serving his range, coordinate the work of the corresponding Range AIs. The AI ranges has been rearranged beginning 2006, and the new ranges are shown below.

**Table B 3.1.1      AI Ranges in the Study Area**

Rajangana Right Bank	Rajangana Left Bank	Nachchaduwa
Rajangana	Saliya-Asokapura	Shrawastipura
Nilgala	Yaya 2	Madawalagama
Puttalamhandiya	Abhayapura	Divulwewa
Adikarampura	Solewewa	Thuruwila
Gemunupura		
Angamuwa		

Source: Inter-provincial DOA, Anuradhapura.

Each range consisted of 800 – 1,000 farm families. However, due to the high degree of land fragmentation observed in the area, the number of operators each AI has to cover is much larger. The AI ranges of the provincial DOA, on the other hand, consist of 3,500 to 4,000 farm families. The annual work program of the AIs is shown in Table 3.1.2. Priorities for implementation of specific activities by each AI are determined based on the particular conditions of his range, e.g., in major irrigation areas, paddy and related activities received prominence. Former arrangement where the ARPAs of the ASCs are assigned to the AI to assist in conducting field work for 3 working days a week does not operate any more. In few instances where the system appears to be working, it is based on personal rather than official relations.

Research-extension linkages are maintained through the pre-seasonal Provincial Technical Working Group (PTWG) meetings attended by research staff of central DOA and officers of the provincial and inter-provincial DOA. All senior AIs, placed at the ASC level too participate in these meetings. PTWG meets twice a year in February and July, to review problems and issues in the previous corresponding season and to set up priorities for the current season.

One of the priority programs of the IP DOA is the ‘Yaya’ (tract) Demonstrations initiated in 1996/97 Maha season, are presently continued as the technology package under the Granary Area Program (GAP). Yaya demonstrations attempt to harness productivity

potential of a high yielding package of practices consisting of the following components.

- Cultivation according to the crop calendar.
- Improved land preparation to recommended depth.
- Use of high quality seeds.
- Addition of organic manure to improve soil fertility status.
- Use of straight fertilizers to make mixtures
- Proper control of weeds
- Application of IPM practices
- Improved post-harvest technologies.

In addition, the GAP intervention strategies include irrigation support through need based water issue systems, agrarian support through credit, marketing and inputs, and institutional support through cooperation among FOs, government officers and private sector institutions. The GAP, implemented in 2002, aims to produce at least 70% of national rice requirement in the granary areas (271,000 h in 16 districts, including Anuradhapura and 5 Mahaweli project areas), while ensuring an income level of Rs. 7,500 per farm family. Toward these objectives, GAP has targeted (a) increasing average paddy yield to over 6.5 t/h, (b) increasing cropping intensity to over 185%, and (c) covering the total project area within a period of 3 years.

For 2005/06 Maha season, a total of 106 Yaya demonstrations have been laid down in the Study area and their distribution is shown below.

**Table B 3.1.2 Distribution of Yaya Demonstrations in Study Area: 2005/06 Maha**

Location	No. of AI Ranges	No. of Demonstrations	Land Extent ha	No of Farmers
Rajangana RB	10	50	678	924
Rajangana LB	5	21	258	353
Nachchaduwa	2	17	232	272
Thuruwila	1	8	101	148

Source: DOA

A major problem identified in the field was that the practices introduced through Yaya demonstrations are often confined to the demonstration only. The adoption rate is low, and the farmers in most instances return to their original practices. One reason for this situation is the poor follow-up action to encourage trained farmers to continue the improved practices. This may be due to large number of new demonstrations scheduled for a season which allow a very limited time for the AIs to carry out follow-up work coupled with his poor mobility.

To promote use of good quality seed paddy among farmers, the IP DOI implements seed farms through involvement of FOs and individual farmers. Further, 2 kg seed paddy package is distributed among farmers for self seed production. The seed farms of FOs initiated through IMD in Nachchaduwa in 2003 Yala has been unsuccessful.

### 3.1.2 Animal Husbandry

Livestock development and extension services are provided by 4 veterinary surgeons (VSs) placed at DS area level. Being a subject fully devolved to provincial administration, the VSs Nachchaduwa, and Rajangana (RB) are under the Provincial Department of Animal Production and Health (PDAPH), Anuradhapura district of the North Central Province, and the VSs Karuwalagaswewa (LB), and Giribewa (LB), under PDAPH, Putlam district and Kurunegala district of the North Western Province, respectively. Each VS is supported by 2 Livestock Development Instructors (LDIs). Following services are provided for development of livestock sector in the Study area.

#### (1) Dairy Development Programs

##### a) Dairy Village Development Program

Jersey Sahiwal crosses 3 – 5 year old cows/heifers were supplied to selected farmers by the Department at 50% of the cost. The price was determined based on the live weight of the animals and had been valued at a maximum of Rs. 35,000 per animal. The program targeted 20 animals for sale in 2005 in Nachchaduwa, but only 8 were sold to farmers because of a decision to remove the original 50% subsidy.

##### b) Cattle Shed Development Program

Operated with funds from the line Ministry, selected large and small scale farmers from Thuruwila and Athuruwela areas were provided with 50% of estimated cost of constructing a cattle shed up to a maximum of Rs. 44,000.

##### c) Pasture Development Program

To promote growing of high quality feeding materials, 18,000 cuttings of fodder variety CO-3 were distributed among farmers in 2005.

##### d) Milk Collection

The milk collection route of Milco and Nestle has been extended to cover a wide area in Nachchaduwa and Rajangana, respectively, thereby increasing the daily collection significantly, benefiting many new milk suppliers.

#### (2) Poultry Development

The layer breed Shaver has been introduced among selected farmers to promote back-yard poultry and has been widely accepted as seen from the growing demand for chicks.

#### (3) Goat Development

##### a) Model Village Program (MVP)

17 farmers selected under this program were provided with up to Rs. 25,000 each from provincial funds for construction of goat shed and purchase of goats as a package. Female and stud goats are provided to them as well as other goat farmers in

the area for a period for upgrading their herds, on an exchange arrangement.

b) Participatory Rural Development Project (PRDP)

A program similar to the MVP is operated under the PRDP, where 2 females and one male goats are issued to a farmer to raise his own stock over a period of 2 years, after which the animals released to a new farmer. Animals used in this program are insured with the Agricultural Insurance Board against unforeseeable losses.

(4) Extension and Animal Health

a) Mobile Clinic

With financial support of Milco, a mobile service has been established to visit the field on a regular program once a month providing clinical services to cover one half of the service area. Since its commencement the popularity of the program has increased substantially.

b) Routine Services

The LDIs operate a daily field visit program in their respective sectors providing services to livestock farmers. The routine services include following.

i) Artificial insemination

ii) Pregnancy diagnosis

iii) Vaccinations against:

- Hemorrhagic septicemia
- Foot and Mouth
- Black quarter

iv) General advice and farmer training

3.1.3 Private Sector

Private sector agencies provided a limited market oriented extension service in the project area. With the consent of relevant provincial and inter-provincial authorities, field demonstrations on DOA approved new releases of agro-chemicals and farm machinery/equipment are held in farmers fields from time to time.

**3.2 Training**

3.2.1 Survey of Field Extension Staff

A survey was carried out on AIs, SMOs and the Segment AO using a questionnaires to find out the (a) training they have undergone during 2004/05 period, (b) subject areas they wished to have further training in the future, (c) main problems they face in carrying out their usual duties, and (d) main problems the farmers confront in adopting technology. The questionnaire used to collect information is shown in **Attachment B3**.

(1) General

All 13 AIs in the Study area are diploma holders in agriculture, ages ranging from 27 to 59 years (average 37 years), and had served in Anuradhapura district for periods ranging from 1 to 33 years (average 7.5 years). Except 3 AIs who use motor cycles for official field traveling, all others used public transport.

(2) Training in 2004/2005

Ten AIs, out of the 13 working in the Study area, underwent 1 – 3 day training in IPM at the Farm Mechanization Training Center (FMTC), Anuradhapura in 2004, while 12 officers underwent further training on IPM in 2005. The results are summarized in **Table B 3.2.1**.

(3) Training Needs

In identifying the training needs, the number of responses (16%) was highest for training in computers, followed by landscaping (13%). Training in IPM and bee-keeping were identified as the third priority with 11% responses. 8% of the AIs reported on need for training on micro-irrigation and on farm machinery, while a little over 6% of the responses were for floriculture and water management. Subject areas such as farm management, project planning, food processing and horticulture ranked low with one response for each. The results are summarized in **Table B 3.2.2**.

(4) Job Constraints

Among the main constraints in carrying out the assigned duties, time loss due to transport problem and lack of teaching aids to conduct farmer training emerged as most important issues. Beside these, there were differences in the constraints identified by AIs in Rajangana and Nachchaduwa (including Thuruwila) schemes. An analysis is given in **Table B 3.2.3**.

(5) Farmers Problems

AIs identified problems relating to irrigation (22%), scarcity of good quality seed of paddy and OFCs (20%), followed by marketing problems (16%) as the major problems faced by the farmers, both in Rajangana and in Nachchaduwa. Results are summarized in **Table B 3.2.4**.

(6) Training Needs of SMOs and Segment AO

The segment AO and SMOs identified seed technology, farm integration and water management as priority areas for their training.

**Table B 3.2.1 Training of Agricultural Instructors 2004/05**

Subject	2004			2005		
	No.Trained	Period (d)	% Trained	No.Trained	Period (d)	% Trained
Micro-irrigation	7	5	53.8	1	5	7.7
Integrated Pest Management	10	1 - 3	76.9	12	1 - 3	92.3
Water Management	1	2	7.7			
Village Development				2	2	15.4
Cyber Extension				1	5	7.7
Granary Area Program	1	5	7.7			
IPM Vegetables				1	5	7.7
No Training	2		15.4	1		7.7

Source: Survey of Officers AIs. JICA Study Team

**Table B 3.2.2 Training Needs Identified by Agricultural Instructors**

Subject	No of Resp	%	Subject	No of Resp	%
Computer Training	10	15.9	Landscaping	8	12.7
IPM	7	11.1	Bee Keeping	7	11.1
Micro-irrigation	5	7.9	Farm Machinery	5	7.9
Floriculture	4	6.3	Water Management	4	6.3
Extn. Methodology	3	4.8	Tissue Culture	3	4.8
OFC Agronomy	2	3.2	Marketing	1	1.6
Horticulture	1	1.6	Food Processing	1	1.6
Farm Management	1	1.6	Project Planning	1	1.6

Source: Survey of Officers AIs. JICA Study Team

**Table B 3.2.3 Constraints in Carrying out Duties Identified by Agricultural Instructors**

Constraint	Nachchaduwa		Rajangana		Study area	
	No of Resp	%	No of Resp	%	No of Resp	%
Time lost due to transport problem	3	16.7	7	15.9	10	16.1
Poor farmer participation in training	3	16.7	6	13.6	9	14.5
Difficult to coordinate marketing	3	16.7	2	4.5	5	8.1
Delayed transfer of technologies	3	16.7	1	2.3	4	6.5
Lack of modern teaching aids	4	22.2	6	13.6	10	16.1
Insufficient travelling allowance	1	5.6	9	20.5	10	16.1
Lack of bi-weekly training	1	5.6	0	0.0	1	1.6
Performance not assessed	0	0.0	1	2.3	1	1.6
No regular in-service training	0	0.0	1	2.3	1	1.6
Poor extension planning	0	0.0	2	4.5	2	3.2
Lack of residential facilities	0	0.0	3	6.8	3	4.8
No training on other related areas	0	0.0	4	9.1	4	6.5
Poor road conditions	0	0.0	2	4.5	2	3.2

Source: Survey of Officers AIs. JICA Study Team

**Table B 3.2.4 Field Problems of Farmers Identified by Agricultural Instructors**

Problems	Nachchaduwa		Rajangana		Study area	
	No of Resp	%	No of Resp	%	No of Resp	%
Shortage of water	2	7.7	0	0.0	2	2.7
Poor irrigation system	4	15.4	4	8.3	8	10.8
Poor water management	4	15.4	2	4.2	6	8.1
No field ownership	3	11.5	0	0.0	3	4.1
Marketing problems	4	15.4	8	16.7	12	16.2
Shortage of good quality seeds	4	15.4	10	20.8	14	18.9
Legal issues on growing OFCs	3	11.5	0	0.0	3	4.1
Shortage of agric. machinery	1	3.8	0	0.0	1	1.4
Lack of unity	1	3.8	1	2.1	2	2.7
Poor marketing strategies	0	0.0	2	4.2	2	2.7
High labour wages	0	0.0	1	2.1	1	1.4
High cost of pesticides	0	0.0	1	2.1	1	1.4
High cost of OFC seeds	0	0.0	1	2.1	1	1.4
High cost of farm equipment	0	0.0	1	2.1	1	1.4
Poor transport facilities	0	0.0	8	16.7	8	10.8
Poor maintenance of pumps (Lift)	0	0.0	1	2.1	1	1.4
Lack of standards for inputs	0	0.0	1	2.1	1	1.4
Ineffective agrarian services	0	0.0	1	2.1	1	1.4
Financial problems	0	0.0	5	10.4	5	6.8
Unidentified diseases	0	0.0	1	2.1	1	1.4

Source: Survey of Officers AIs. JICA Study Team

### 3.3 Training Institutions

A survey of training institutions in and around the Study area was carried out to determine facilities and resources available, the type of trainees, areas of training offered and the level of training conducted. There are three main training institutes that provide training on agriculture and related fields to trainers as well as farmers. Description of these three institutions are given below.

#### 3.3.1 Farm Mechanization Training Center, Anuradhapura.

The Farm Mechanization Training Center (FMTC), the only national level training centre on farm mechanization, is located at Puliyankulama, about 5 km from Anuradhapura town. It was established under grant aid from Government of Germany in 1971 on a 14 hectare block of land.

##### (1) Organization

FMTC functions under the central DOA, and is headed by an Assistant Director of Agriculture reporting to the Extension Training Division. The operations are divided into two broad Sections, the Training Section and the Supporting Section. General administration, farm, library and hostel come under the Supporting Section, while the Training Section consists of Programming, Operation and Maintenance, Training Workshop and External Training. Organizational structure is annexed.

##### (2) Resource Persons

At present, the Center operates with a highly depleted staff cadre which has caused two units in the Training Section, namely the Workshop Technology and Repair of Farm Machinery, to suspend training operations due to want of trained staff. Following available staff members in the FMTC serve as resource persons.

**Table B 3.3.1 Staff Members of Farm Mechanization Training Center**

Position	Section	Unit	Qualification	No Available	Cadre
Assit. Director	General		M. Sc	1	1
Agricultural Officer	General		B. Sc	1	2
Mechanical Engineer	Training Section	Operation & Maintenance	B. Sc	1	1
Instructor	Training Section	Operation & Maintenance	Diploma	1	10
Agricultural Instructor	Training Section	Operation & Maintenance	Diploma	3	5
Technical Officer	Training Section	Workshop	NDT	1	10
Agricultural Instructor	Training Section	Programs	Diploma	1	1
Agricultural Instructor	Supporting Section	Farm	Diploma	1	3

Source: FMTC

The external resource persons for courses conducted by FMTC are mainly officers of the central DOA.



(3) Facilities

a) Lecture Rooms

The center has one large lecture room (auditorium) and two small lecture rooms.

**Table B 3.3.2 Lecture Rooms of Farm Mechanization Training Center**

	Capacity	Facilities	Rate per day	Needs
Auditorium	60 - 70	Multimedia, laptop, OHP, slide projector, audio system	Rs. 2,500	Replacement of furniture
Lecture Room 1	30	Magi-board	Rs. 500	Replacement of furniture
Lecture Room 2	30	Magi-board	Rs. 500	Replacement of furniture

Source: FMTC

b) Hostel

Hostel consists of two 3 storied buildings each accommodating 45 persons. There is one room in each floor that accommodates five persons while the others are for two persons. Two rooms are kept reserves for visitors and external resource persons. All rooms are provided with attached toilets.

**Table B 3.3.3 Accommodation of Farm Mechanization Training Center**

Rooms	Number	Persons
5 Bed	6	30
2 Bed	28	56
2 Bed (reserved)	2	4
Total	36	90

Source: FMTC

The rooms are airy and maintained in very good condition, compared to those at IPHT and ISTI.

c) Kitchen and Dining areas

Spacious dining area provides accommodation to over 100 diners and the meals are provided on self service basis. Crockery and cutlery is available. Cooking is done in attached kitchen area using firewood. Attached to the dining hall is the recreation or common room where limited seating is available.

(4) Charges

**Table B 3.3.4 Charges of Rooms and Meals of FMTC**

Item	Rates (Rs./day)	Remarks
Hostel for farmers	11/bed for room sharing and all meals per person	Special rate applicable to DOA arranged programs
Hostel for farmers and others	Accommodation: 75/bed Meals and tea: 218	Programs arranged by outside parties
Special Meals	B/F: 100; Lunch & dinner: 200; Tea: 50	
Extra Special Meals	Lunch & dinner: 350;	
Common room and	2000	Rs. 300 per extra hour

Item	Rates (Rs./day)	Remarks
Dining hall for 4 hours		
For all others	Accommodation: 75/bed	

Source: FMTC

#### (5) Other Assets

The facility is equipped with following assets.

- Vehicles 2 nos Double Cabs
- Workshops
- 2 Wheel tractor laboratory
- 4 Wheel tractor laboratory
- Crop protection equipment laboratory
- Farm tools laboratory
- Demonstration Farm
- Stores

#### (6) Training Programs

FMTC is conducting 11 training programs to a wide range of trainees, covering farmers, officers of government, NGOs and private sector, students from universities, etc. Progress of Training in 2004 and 2005 are shown below.

**Table B 3.3.5 Training by FMTC in 2004 and 2005**

Title	2004			2005		
	No. of Classes	No. of Trainees	Man-days	No. of Classes	No. of Trainees	Man-days
Two wheel tractor operation and maintenance	5	105	511	8	119	397
Four wheel tractor operation and maintenance	9	218	1280	12	246	833
Water pump operation and maintenance	7	119	196	9	150	234
Tow wheel and four wheel operation and maintenance	4	91	531			
Plant protection equipment operation and maintenance	8	118	224	7	145	227
Combine harvester operation and maintenance	2	184	160	9	215	435
Farm machinery operation and maintenance	13	338	2690	20	739	2284
Farm machinery studies	5	250	232			
Plowing implements	1	9	45			
Micro-irrigation	17	474	1254	14	252	623
Workshops	12	811	811	6	242	468
Special training on institutional requests	3	106	220			
Home gardening				3	89	67
Productive vehicle maintenance				2	94	188
Solar powered irrigation				2	105	123
Field tours				1	40	40
Pre-seasonal training				1	52	260
Reaping machine				1	41	20
Total	86	2773	8154	95	2529	6199

Source: FMTC

Because of the staff limitations, some of the training programs have been suspended. The current programs conducted and those that were stopped are given below.

#### Present Training Courses

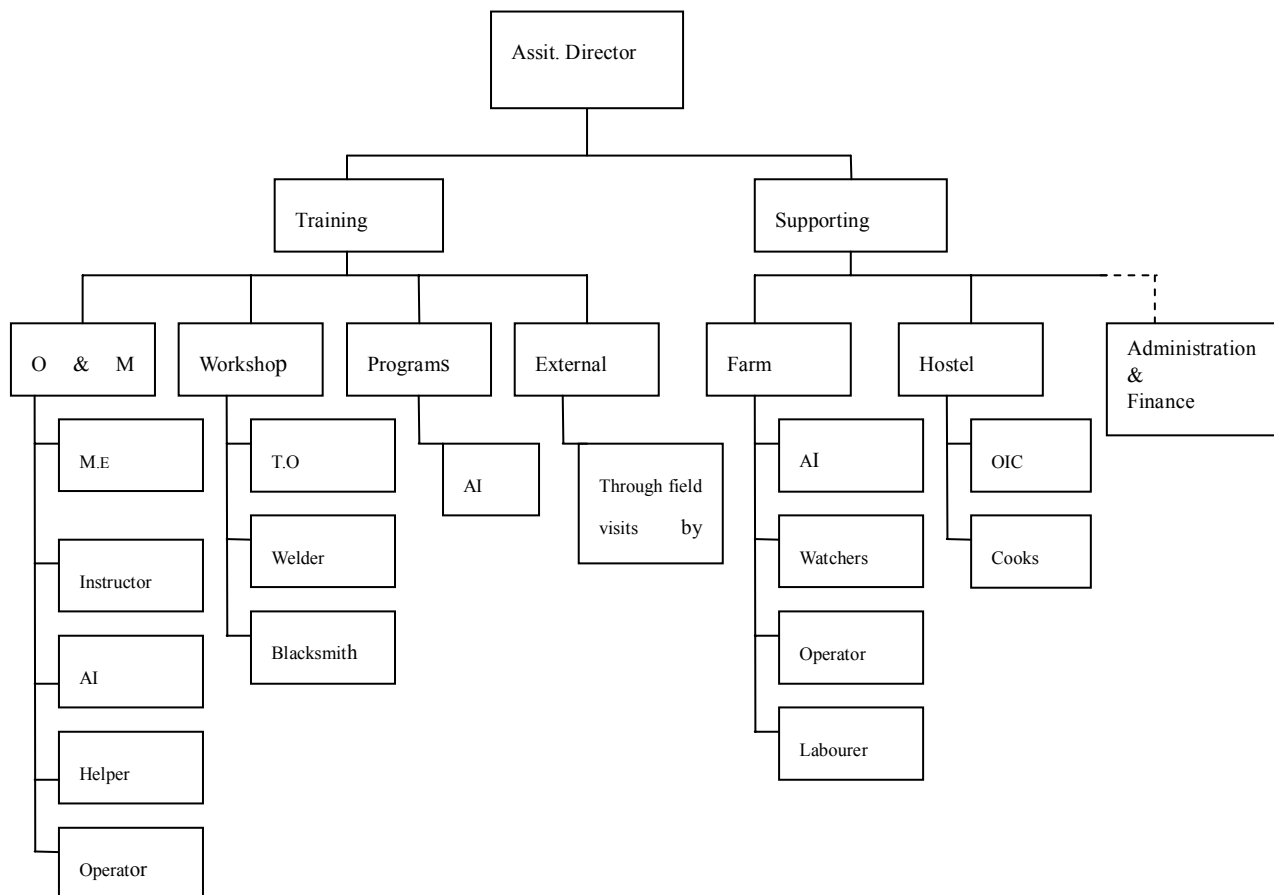
- Operation and maintenance of 4 wheel tractors
- Operation and maintenance of 2 wheel tractors
- Operation and maintenance of water pumps
- Operation and maintenance of plant protection equipment
- Operation and maintenance of lowland seeders
- Operation and maintenance of upland seeders
- Operation and maintenance of Reaping and threshing machines
- Operation and maintenance of combine harvesters
- Introductory training on micro-irrigation systems
- Detailed training on micro-irrigation systems
- Special training programs on request

#### Training Courses Suspended

- Metal works: parts 1 and 2 (4 weeks each)
- Gas welding and arc welding (2 weeks each)
- Basic skills in forging (2 weeks)
- Basic repairs in diesel engines (2 weeks)
- Power transmission of tractors (4 weeks)
- Hydraulic systems in tractors (2 weeks)
- Electrical systems of tractors (2 weeks)
- Repair of plant protection equipment (2 weeks)
- Repair of water pumps and irrigation accessories (2 weeks)
- Repair of 2 wheel tractors (2 weeks)
- Repair of farm machinery: parts 1 and 2 (4 weeks each)

#### (7) Individuals, Organizations and Institutions Serviced in 2005

- Farmers
- Tractor operators
- Officers of the DOA
- Officers of other government officers
- Students of agricultural, technical schools and universities
- School dropouts
- Officers of NGOs
- Private companies and institutions
- School children



**Figure B 3.3.1 Organizational Structure of FMTC**

**3.3.2 In-service Training Institute, Mahailuppallama (ISTI-MI)**

**(1) Organization:**

The ISTI-MI functioned under the Extension and Training Division of Central DOA until the subject was devolved to the Provincial Government under the 13<sup>th</sup> Amendment to the Constitution in 1988. It now operates under the provincial DOA of provincial Ministry of Agriculture.

**(2) Resource Persons**

Of five carder provision for Subject Matter Specialists (SMSs), only 2 are filled. One is on study leave, leaving only one SMS for the Institute. She is assisted by two Agricultural Monitoring Officers (AMOs), two Program Assistants (PAs) and staff of the demonstration farm to conduct training programs as resource persons. Full time resource persons available in the Institute are shown blow.

**Table B 3.3.6 Resource Persons of ISTI-MI**

Position	SMS	AMO	PA	Extension Officer
Qualification	Post-Graduate	Graduate	Graduate	Diplomate
No. Available	1	2	2	1

Source: ISTI-MI

External resource persons are engaged for conducting the training programs and they are paid according to their academic qualification as follows.

**Table B 3.3.7 Allowance for Resource Persons**

Qualification	Rate per Hour (Rs)
Graduate or Diploma level	300
Post-graduate	400

Source: ISTI-MI

For internal programs, outside resource persons usually officers eg., researchers from central and provincial DOAs are engaged. They are expected to use their official vehicles for transport, for which a fuel allowance is provided by the ISTI. The particulars of external resource persons engaged in 2005, are given below.

**Table B 3.3.8 Profession of Resource Persons**

External Resource Persons	Nos. Engaged
Agricultural Monitoring Officers	7
Agricultural Instructors	14
Subject Matter Officers	10
Research Officers	38
Bee Keepers	12
Budder	9
Others	25

Source: ISTI-MI

### (3) Facilities

#### a) Lecture Rooms

The institute has an auditorium and 2 lecture rooms.

**Table B 3.3.9 Lecture Rooms of ISTI-MI**

	Accommodation Nos.	Facilities Available	Rate per day (Rs)	Needs
Auditorium	150	Multimedia projector, Laptop, OHP, Slide Projector, Magi Board	920	Audio System CD/DVD Player Digital Camera, air conditioning
Lecture Room 1	60	OHP, Slide Projector, Magi Board	345	
Lecture Room 2	30	Magi Board	345	

Source: ISTI-MI

#### b) Hostel Accommodation

The hostel has 22 rooms that can accommodate 50 persons. Three rooms are unusable due to need of repairs.

**Table B 3.3.10 Accommodation of ISTI-MI**

Rooms	Number	Currently Used	No. of Persons
2 Bed	8	7	14
3 Bed	14	12	36
Total	22	19	50

Source: ISTI-MI

While the building and the garden are fairly well maintained, the soft furniture and toilets are in poor condition. Each toilet serves 2 adjacent rooms and are fitted with commodes, which are not acceptable to most resident farmers on training programs. Refurbishment of the attached toilets and constructing outside (unattached) toilets with squatting pans, which are favored by the farmers, is anticipated. Further, repairs to the rooms presently not used and replacement of soft furniture are also required. The hostel has a spacious common room with seating and TV.

## c) Dining

The Kitchen has very basic equipment and cooking is done using firewood. It has limited cold storage facilities. Dining area accommodates up to about 100 persons at a time and basic crockery is available. According to the Warden, the staff can serve meals comfortably to about 30 persons on a continuous basis.

## (4) Charges

**Table B 3.3.11 Charges of Accommodation and Meals of ISTI-MI**

Item	Charges (Rs.)
Accommodation/person/day	46
Food/person/day	204
Special lunch/dinner per serving	175
Special breakfast per serving	87
Special tea per serving	42

Source: ISTI-MI

## (5) Other Assets

Other main assets of the ISTI are listed below.

- (a) Vehicles
  - 30 Seater Bus 1 no.
  - Jeeps 2 nos.
  - Double Cab 1 no.
- (b) Open-air Theatre capacity 200
- (c) Demonstration Farm Extent 10 ha.  
Paddy, OFC, Horticulture, Floriculture, Mushroom demos.
- (d) Basic mechanical workshop
- (e) Stores complex. (in poor state needing repairs)

## (6) Training Programs

The training programs conducted from January to December, 2005 are listed below.

**Table B 3.3.12 Training Programs Conducted from January to December, 2005**

Program Title	Trainee Category	Duration (days)	No. of Programs
Floriculture	Farm Women/Farmers	1-2	4
Mushroom Cultivation	Farmer Representatives	3	2
Maintenance of FO Records	Als and AMOs	1	1
School Agriculture Program	Students	1	13
Vegetable Cultivation & Pest Management	Farmers	1	1
General Agriculture & Agricultural Institutions	Non Agricultural Govt. Officers	1	1
Market Oriented Cropping Patterns	Farmers	1	1
Home Gardening	Farm Women/ Volunteers	1	3
B Onion Seed Production & Pest Management	Farmers	1	2
Fruit Nursery Management	Farmers	1	1
Plant Nursery Establishment & Management	Farmers (SLANRMP)	2	1
Extension Training Program	Farmers	1	1
General Agriculture	Farmers (FAO)	2	1
Home Gardening	Inmates of Children Home	1	1
Pre-seasonal Training	Officers of Mahaweli H	2	1
Crop Production under Agro-wells	Farmer Representatives	2	3
Home Gardening	Aryuwedha	2	1
Home Gardening	Farm Women/Farmers	2	7
Vegetable & Fruit Post Harvest Technology	Farmers	1	1
Home Gardening	School Childen	1	1
Practical Agricultural Session	School agriculture teachers	2	3
Plant Nursery and Budding	Entrepreneurs	1	1
Bee Keeping	Farmers	1	4
OFC Cultivation	Farmers	1-2	7
Soybean Cultivation under Rain-fed Conditions	Officers	1	1
Dry Zone Crop Production	Farmer Representatives	2	2
Maize and Soybean Cultivation	Farmers	1	1
B Onion Cultivation	Farmers	1	1
Agricultural Technology	AI Office Assistants	3	2
Chilli Cultivation	Farmers	1	1
Dry Zone Crop Production	Field Officers (Mahaweli B)	2	1
Floriculture	Flower Growers	1	1
Hybrid Seed Production of Maize	Als	2	1
Establishment of 1 ac Max. Yld. Plots of Paddy	Farmers	2	1
Technology to Increase Paddy Yield	Farmers	1	1
Preparation of Environmental Project Reports			1
Aerial Photography			1
Water Management			1

Source: ISTI-MI

## (7) Organizations and Institutions Serviced in 2005

### a) State Organizations

- Department of Agriculture (North-Central Province)
- Ministry of Agriculture (North-Central Province)
- Department of Agriculture Central

Extension & Training Division, Peradeniya  
 Plant Protection Service, Gannoruwa.  
 Seed Certification Service, Peradeniya.

- Department of Agrarian Development
- School of Agriculture Pelwehera.
- Divisional Secretariat Horowpathana.  
Palagala
- Ministry of Agriculture, Lands and Irrigation
- Mahaweli Authority
- Water Supplies Project, Thuruwila
- Ministry of Women Empowerment and Social Welfare
- Department of Land Commissioner

b) Non-Governmental and International Organizations

- Resource Development and Environment Organization
- International CARE
- Community Water Supplies and Sanitation Project
- REEP, Matale
- USDA
- FAO
- CIC Company
- Sri Lanka Australia Natural Resource Management Project

(8) Progress

The number of training sessions and number trained during last 6 months of 2005 are analyzed below.

a) By Subject

**Table B 3.3.13 Training Programs and Number of Trained**

Programs	No. of Programs	No. Trained
Agricultural Training	61	1701
Non Agricultural Training	05	221
Agricultural Workshops	12	297
Non Agricultural Workshops	05	293
Total	83	2512

Source: ISTI-MI

b) By Trainees

**Table B 3.3.14 Number of Trainees and Their Professions**

Trainees	No. of Programs	No. Trained
Officers	45	1185
Farmers	33	1128
Students	05	199
Total	83	2512

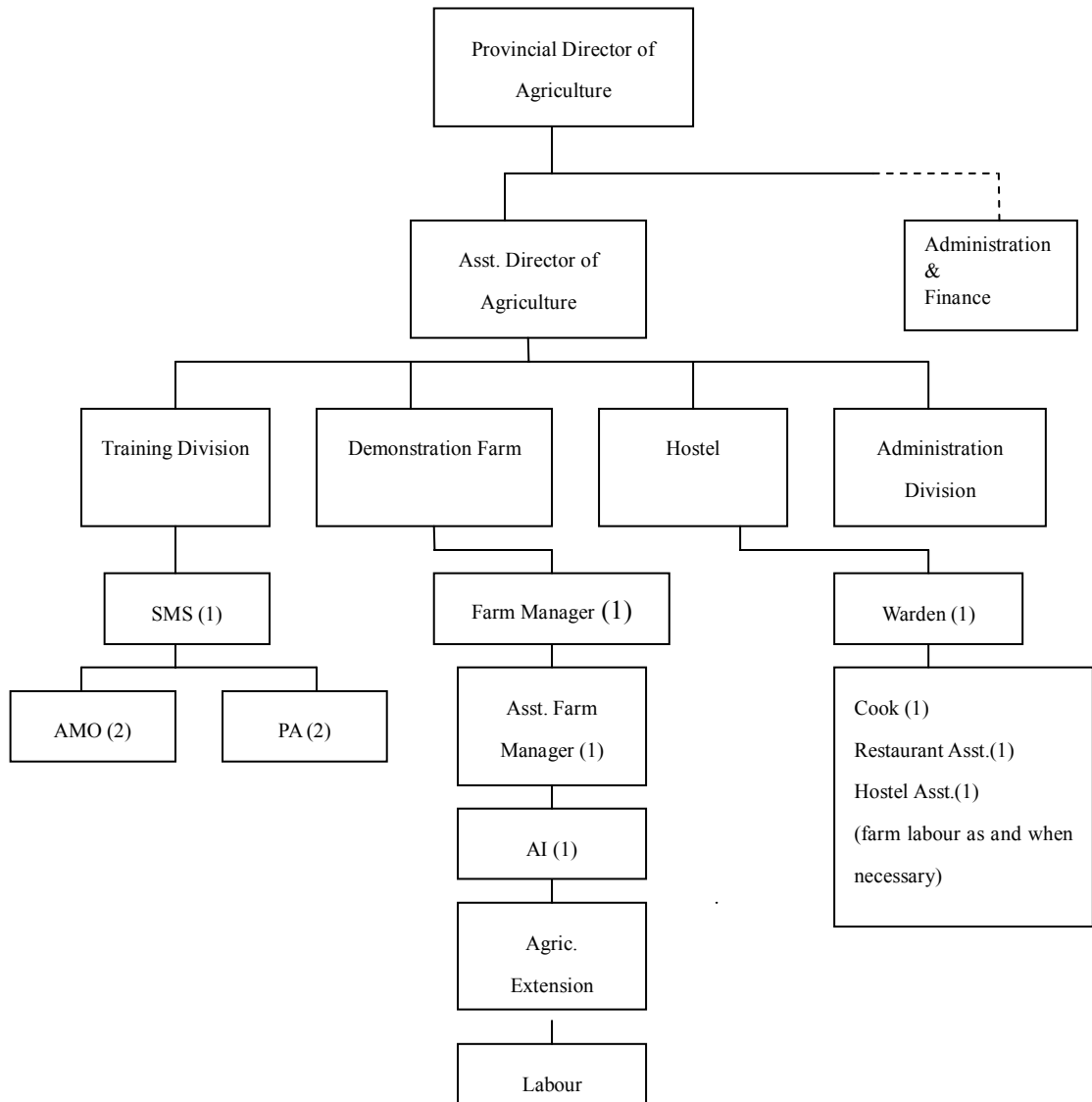
Source: ISTI-MI



(9) Problems and Issues

The Five Year Plan 2006 – 2010 of the ISTI envisages development and improvement of following areas. Most of the problems arise from insufficient material resources and are included in the Plan.

- Improve Training Programs
- Improve Demonstration Farm – procure farm equipment, etc
- Repair Office Complex – procure office equipment, etc
- Construct Lecture Halls Open Lecture Theatre for 40 trainees and equip
- New Hall for 40 trainees and equip; 6 rooms to accommodate external resource persons.
- Air Condition the Auditorium
- Procure Audio Visual Equipment
- Improve Infrastructure
  - Hostel
  - Dining Hall
  - Detached Toilets
  - Official Quarters
- Procure Diesel Generator
- Modernize Mechanical Workshop



**Figure B 3.3.2 Organization Structure of ISTI-MI**

3.3.3 Institute of Post Harvest Technology (IPHT), Anuradhapura.

(1) Organization

The Rice Processing Research and Development Center of the Paddy Marketing Board was restructured and commenced operations as IPHT under management of a Board of Directors headed by a Chairman, appointed by the Ministry of Agriculture, from June 2000.

IPHT is headed by the Director assisted by Deputy Director and (DD) Administration Manager. Eight technical divisions function under the DD, each with a divisional head, 2 divisions directly under him, 3 divisions under 3 Senior Research Officers (SROs) and 2 divisions under Senior Mechanical Engineers (SMEs). Depending on the nature of activities, Research Officers and Mechanical Engineers are attached to each division.

(2) Resource Persons

All executive staff members, particularly those attached to the technical divisions, function as resource persons as well. The present staff strength is shown below.

**Table B 3.3.15 Resource Persons of IPHT**

Position	Qualification	Number
Director	Ph. D	1
Deputy Director	M. Sc (Agric.)	1
Manager Administration	B. Sc (Agric)	1
SRO	M. Sc	2
SME	B. Sc	1
Asst. Manager Finance	B. Sc	1
Research Officer	B. Sc	11
Mechanical Engineer	B. Sc	5
Extension Officer	B. Sc	2
Technical Officer	NDT	2

Source: IPHT

External resource persons are sometimes engaged for special training programs and are paid Rs. 350 – 500 depending on the qualifications. Very few external persons are engaged for training programs. For transport, if not arranged by IPHT, a payment is made.

(3) Facilities

a) Lecture Rooms

Following facilities are available for conduct of training programs.

**Table B 3.3.16 Lecture Rooms of IPHT**

	Capacity	Facilities	Rate per day	Remarks
Auditorium I	70	Multimedia, slide projector, audio and video, OHP, laptop	Rs 1000 week days Rs 1350 week ends	
Auditorium II	150			To open soon
Lecture Hall I	45	OHP, etc	Same as above	
Lecture Hall II	50			To open soon

Source: IPHT

b) Hostel

The hostel has 31 2-bed rooms of which 24 are serviceable. In addition, there are 5 special rooms with ACs for special quests, such as external lecturers. The hostel presently accommodates 48 trainees at a time. It is also provided with 3 common external or detached toilets fitted with squatting pans for those who prefer them.

c) Dining

Two dining areas are available, each with seating for 48 persons (total 96 – 100), at a time. It has sufficient cutlery and crockery to serve 100 diners. The Kitchen is equipped with gas cookers but one fridge. This is not a drawback as provisions are easily accessible from the city.

(4) Charges

**Table B 3.3.17 Charges of Accommodation and Meals of IPHT**

Item	Charges/day (Rs)
Accommodation twin sharing (for trainees)	75
Outsiders	150 - 300
Special Rooms (AC)	330 - 500
Special Rooms (non AC)	200 - 350
Lunch/Dinner	70
Breakfast	45
Tea	8
Special Meals/Tea	On request

Source: IPHT

(5) Other Assets

Main assets the IPHT possesses are listed below.

- Rice Mill
- Mechanical Workshop
- Rice based product factory: Noodles, bakery products, etc
- Fruit Lab: Jams, cordials, etc
- Model Farm: For research purposes
- Laboratories
- Library
- Vehicles:
  - Van- 19 seater      1      16 yrs old
  - Double Cabs      3      5 yrs ols
  - Jeeps      2      3 yrs old and 25 yrs old

(6) Training Programs

**Table B 3.3.18 Training Programs Conducted in 2004 by Type**

Type of Program	Number	Duration
Short term Residential/Study Visits	57	1 – 6 days
Non-Residential	29	
Field Training/Demonstrations (Island Wide)	156	

Source: IPHT

**Table B 3.3.19 Training of Personnel in 2004 by Category**

Trainee Category	Number Trained	Percentage
Farmers, farm women, FOs, Farmer Co.	2597	46
Large scale rice/grain processors	56	1
Rural level rice/grain processors, self employment beneficiaries	734	13
Small/medium scale rice/grain processors	170	3
Fruits and vegetable cultivators and collectors	734	13
Students of schools/universities/others	337	6
Extension Officers of public/private/Co-op/NGO sectors	678	12
Spice growers and collectors	337	6
Total	5643	

Source: IPHT

**Table B 3.3.20 Currently Operating Curriculum of IPHT.**

Program	Trainee Category	Duration (d)
Post harvest technology of grains - 01	Farmers, grain processors, officers, students and entrepreneurs	2
Post harvest technology of grains - 02	- do -	3
Medium and large scale grain processing	Millers, entrepreneurs, grain buyers and processors	5
Small and medium scale rice processing	Grain processors and marketers, entrepreneurs, etc.	3
Rural level paddy and rice processing	Farmers, grain processors, traders, self-employed, officers and students	2
Grain quality management	Commercial and large scale buyers and collectors, Officers and students	1
Grain storage	Commercial scale grain collectors	3
Rice based bakery products	Backers and entrepreneurs	3
Rice and grain based flour production	Grain processors and traders, self-employed, Officers and entrepreneurs	2
Pulse splitting	Farmers, self-employed and entrepreneurs	1
Infant food production	Self-employed, entrepreneurs, Officers	1
Post harvest technology of fruits and vegetables	Farmers, fruit and vegetable processors and collectors, wholesale and retail traders, Officers and students	2
Fruit and vegetable based products	Farmers, those engaged in the field, entrepreneurs, Officers and students	4
Fruit jam production	Farmers, fruit processors, self-employed, entrepreneurs, Officers and students	1
Fruit cordials and instant drinks production	- do -	1
Vegetable and fruit processing	Farmers, fruit and vegetable processors, self-employed, entrepreneurs, Officers and students	2
Tamarind and lime based products	- do -	2
Lime based products	- do -	1
Tamarind based products	- do -	1

Source: IPHT

The IPHT has set up 4 Sectoral Development Committees each comprising of representatives from public, private and NGO sectors working in collaboration with appointed members from Board and Institute.

1. Fruits and Vegetables (Primary Processing)
2. Fruits and Vegetables (Secondary Processing)
3. Rice, Cerials, Grains and Spices (Primary Processing)
4. Rice, Cerials, Grains and Spices (Secondary Processing)

IPHT also provide consultancy services for large, medium and small scale industries by preparing technical and feasibility reports as well as technical drawings. The charges vary between Rs. 1000 and 10,000. For feasibility studies, 0.25% of

#### (7) Future Programs and Developments

The programs conducted in 2005 were similar to those in 2004. However, the training material is subjected to continuous upgrading in keeping with the research and development activities taking place within and outside the Institute.

A number of construction activities had been undertaken in 2005, and it is unlikely that any new works be taken up in the immediate future. The supply of training equipment and furniture for the new auditorium and furnishing for the extended hosted facility are expected through Ministry allocations.

## Chapter 4 PRESENT PROBLEMS AND BASIC APPROACH FOR IMPROVEMENT

### 4.1 Problem Analysis

#### 4.1.1 Problem Tree

Three problem analysis workshops were conducted by the Study team, one with the participation of counterpart officers, steering committee members and invitees, and two with the participation of three FOs and stakeholders. The problems identified at these workshops were combined to develop a sector specific problem tree. Through this exercise, it was possible to identify low income from crop production as the core problem and to differentiate the direct causes into 4 groups for further analysis. The 4 groups of direct causes are 1) weak agricultural extension, 2) high cost of production, 3) low productivity of paddy, and 4) limitations to crop diversification. The problem tree is shown in **Figure B 4.1.1**.

#### 4.1.2 Present Problems and Constraints

Present day farming has to move beyond its framework of merely providing the necessities of life to the farm family. The farmer has to produce maximum surplus to increase his earnings enabling him to satisfy the increasing family demand for cash. This gives agricultural production a market orientation and introduces a business component to the farming profession. A farmer has a certain set of farm resources such as land, labour, working capital, farm equipment, etc., that are relatively scarce. On the other hand, he has a set of goals to achieve. The core need, as has been evident from the problem analysis and field surveys, is improvement of farm income. Paddy cultivation is the major activity of farmers in the Study area and their production makes a substantial contribution to the national paddy production and the food security situation of the country. However, the profitability of individual farmers, generated from paddy cultivation, has remained quite low on account of high production costs, low productivity and low market prices.

The direct causes for low income that emerged from the problem tree were further analyzed under 4 categories, 1) paddy production, 2) OFC, vegetable and fruit production, 3) agricultural extension and 4) other farm income generating activities. Issues relating to productivity and cost of production were brought under category 1, while limitations to crop diversification under category 2. Specific issues under different categories were evaluated based on the study of present situation in the Study area in general and the pilot areas in particular. The details of analysis on the present situation and problem description under each category are given in **Table B 4.1.1**. Because of the relative importance of paddy crop, the sub-categories under Paddy Production (category 1) are briefly described below.

##### (1) Productivity

The study of the present situation shows that the average yield of paddy in the Study area is

around 4.6 – 5.0 t per ha. According to the data from socioeconomic survey of the pilot area, the unit yield ranged between 3.9 and 5.3 t per ha. In large field demonstrations, particularly the tract demonstrations under the GAP, yield levels of 6.0 t per ha have been achieved for the tract while some individual farmers have recorded unit yields beyond 6.5 t per ha.

Thus, there exists a gap between the actual average unit yields realized and the potential unit yields. The main problems for low productivity were identified as follows.

- a) Improper or inadequate application of inputs due to farmers' not having sufficient savings of their own to reinvest or difficulties of obtaining cultivation loans from credit sources for purchase of inputs including good quality seed materials. Access to agricultural credit from institutional credit sources by farmers has been made difficult due to i) non availability of collaterals, ii) previous unsettled loans, iii) long and complicated procedures and iv) in some instances, the banks being located too far away.
- b) Soil infertility due to salinity and low organic matter content
- c) Crop damage by stray cattle and wild animals, particularly in parts of Thuruwila area.
- d) Irrigation problems.

Irrespective of the size of the farm holding, application of improved farming practices along with the divisible inputs have contributed towards high unit yields recorded.

## (2) Production Costs

Cost of production of paddy has shown an increasing trend due to many factors. Cost of machinery, labour and material inputs have continued to increase without a corresponding increase in the market price of paddy which has tended to remain more or less static. This situation has greatly affected the profitability of paddy production. While reduction of the prices of inputs is beyond the control of the farmers, by adopting some cultural practices and deploying indivisible (lumpy) resources, working both individually and more importantly as a group, the farmers can exert some control over the increasing production costs. These include i) application of Integrated Pest Management measures, ii) restoration of traditional "attam" labour exchange system, where possible, iii) deployment of farm machinery for deep tillage, crop establishment, harvesting and combine threshing operations.

## (3) Agricultural Extension

Although much has been achieved over the years through agricultural extension, there is the need for further improvement, mainly in relation to the farmer coverage for transfer of technology and follow-up, facilitation and monitoring. Agricultural extension service has to play a key role in improving and sustaining the unit yield at the anticipated levels. Some of the weaknesses of the current system, noted at discussions held with senior staff members of IP DOA, are listed below;

- a) Locations of the on-farm field demonstrations are widely spread out in the AI range making proper supervision by officials difficult.



- b) Because the extension programs need to be result oriented, there is a tendency to favor the more progressive farmers in selecting candidates to carry out the demonstration and other field programs. This has caused some degree of alienation, where the weaker sections of the farmer community tended to move away from the extension officers and, therefore, the technologies introduced as well.
- c) In carrying out the field work, the AIs tended to communicate only with the farmer leaving out the family members. Involving the family by creating awareness among its members would effectively improve the adoption of recommended practices.
- d) In instances where the benefits of a particular practice are not immediately evident, farmers tended to revert back to his former practice. This necessitates close follow-up to ensure that the practice is continued for sufficiently long period until the farmer sees and accepts the benefits.
- e) Although a vacuum was created when the village level extension agents of the DOA, (the KVSs) were taken out, the ratio of the number of farmers to an extension worker has been minimized in inter-provincial areas by having one AI to cover about 1000 farm families.

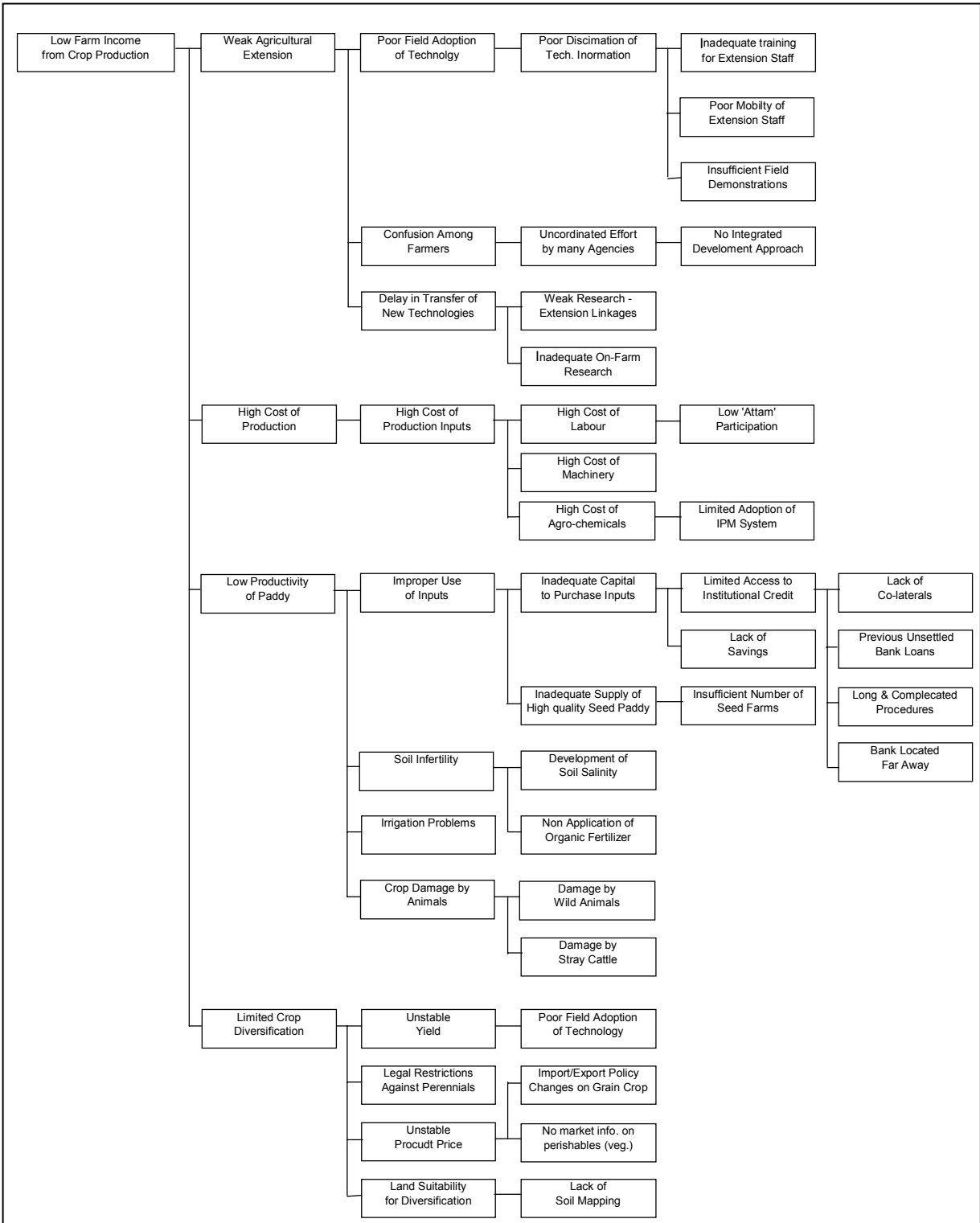
From the point of view of the AIs serving in the Study area, 5 field problems faced by farmers were identified as, i) irrigation problems relating to water management and irrigation facilities (mostly in Nachchaduwa), ii) marketing iii) short supply of quality seeds, iv) poor transport facilities (Rajangana), and v) financial difficulties (Rajangana).

The weaknesses of agricultural extension system were identified in problem tree prepared by the Counterparts and Steering Committee members. The poor decimation of technology as a result of inadequate staff training, poor staff mobility and insufficiency of field demonstrations were seen as the cause for poor field adaptation of technology. Different organizations involved with extension, working independently due to lack of an integrated development approach, have brought about some confusion among farmers as to each organizations responsibility. Further, delays in transfer of technologies to solve field problems arising from weak research-extension linkage and inadequacy of on farm research were also noted.

Following issues were identified by AIs in the Study area as main problems in carrying out their duties; a) transport difficulties, b) lack of modern training aids, c) insufficient traveling allowance, and d) poor farmer participation for training sessions. Among lesser problems, delays in transfer of technologies, difficulties in coordination of marketing and lack of residential facilities were foremost. Some important and relevant issues were raised by one or two AIs concerning lack of regular pre-seasonal training, individual performance not being assessed and poor extension planning.

#### (4) Limitations to Crop Diversification

The existing problems and issues for crop diversification in the irrigated lands were identified as i) unstable yield, ii) legal restrictions, iii) unstable product prices and iv) land suitability.



**Figure B 4.1.1 Problem Tree of Agriculture Sector**

**Table B 4.1.1 Present Situation and Problems for Agricultural Sector (1/4)**

Agriculture

Category	Present Situation	Problems Description
1. Paddy Production		
1.1 Productivity	Common Points	
	<ul style="list-style-type: none"> <li>The Study area has been declared a high potential paddy production area under the GAP (Granary Area Program) program targeting an average yield of 6.5 ton/ha.</li> <li>Target yield have been achieved by some individual farmers and in Yaya (tract) demonstrations.</li> <li>Under the demonstration conditions the participating farmer groups received inputs and credit. With reduced intensity of the support after conclusion of the demonstration, the adoption level and the yield level have tended to decline.</li> <li>Available data from Dept. Census &amp; statistics, DOA and field studies indicate an overall average yield in the range of 4.6 – 5.0 ton/ha for the area.</li> <li>Following yields were recorded in tract demonstrations:  <u>Nachchaduwa and Thuruwila</u>                      03 Yala: 4.99 ton/ha, 03/04 Maha: 5.98 ton/ha,                      05 Maha: 4.52 ton/ha  <u>Rajangana</u>                      03 Yala: 4.92 ton/ha, 03/04 Maha: 5.78 ton/ha                      05 Maha: 4.58 ton/ha (RB), 5.56 ton/ha (LB)</li> </ul>	<ul style="list-style-type: none"> <li>Low sustainability of the yield levels recorded in demonstrations due to:                             <ol style="list-style-type: none"> <li>farmers expectation of same intensity of support from the officers,</li> <li>no follow up support by the officers.</li> </ol> </li> </ul>
(1) Seed Quality	Common Points	
	<ul style="list-style-type: none"> <li>Farmers use self produced seed paddy for 3 – 4 seasons before replacing it with new seed paddy. DOA supplies 2 kg packets of certified seeds to promote self seed production, but supply is not enough.</li> <li>The secondary seed (self produced seed) production from certified seed by farmers group is support by DOA, but, Farmers usually do not keep a special well- maintained plot reserved for seed production nor do they practice selective reaping and threshing at the time harvest.</li> <li>Quality of self produced seed paddy by farmers is below standard germination (85%) and purity (94%) levels.</li> <li>Under the National Seed Policy (1997) DOA does not produce certified seeds.</li> <li>Main supply source of certified seeds for replacement is the private sector.</li> </ul>	<ul style="list-style-type: none"> <li>Inadequate knowledge of farmers on self seed production is to produce self seeds of acceptable quality.</li> <li>Shortage of high quality seed paddy (certified or secondary) for use as replacement seed.</li> <li>Lack of seed farms managed by individual farmers or FOs producing certified or secondary seed paddy (except in Rajangana RB).</li> </ul>

**Table B 4.1.1 Present Situation and Problems for Agricultural Sector (2/4)**

Category	Present Situation	Problems Description
Particular Situation in Nachchaduwa Major Scheme and Thuruwila Medium Scheme		
	<ul style="list-style-type: none"> <li>Un-registered paddy variety 'pokuru samba' is cultivated extensively (60%) by farmers on account of its higher marketing advantage.</li> </ul>	<ul style="list-style-type: none"> <li>As an unregistered variety, DOA does not maintain basic seeds of this variety to produce registered seeds for multiplication as certified seeds by private sector.</li> </ul>
Particular Situation in Rajangana Major Scheme		
	<ul style="list-style-type: none"> <li>Farmers in LB expect certified seeds for replacement to come from DOA. Farmers are not confident of seed paddy produced by private sector although it carries DOA certification.</li> </ul>	<ul style="list-style-type: none"> <li>Shortage of good quality seed paddy as replacement seeds.</li> </ul>
(2) Plant Nutrition	Common Points	
	<ul style="list-style-type: none"> <li>Only 15 – 20% of the farmers practiced incorporation of paddy straw to the field prominent in tract and one acre maximum yield demonstrations.</li> <li>Threshing with low capacity threshers left long strands of straw which made ploughing difficult when added to the paddy field.</li> <li>Farmers rarely added green manure and/or cow dung to paddy fields except in demonstration plots supervised by the AIs.</li> <li>Farmers tended to use the same paddy fertilizer dosages for all varieties.</li> </ul>	<ul style="list-style-type: none"> <li>Degradation of soil productivity due to low organic matter status.</li> <li>Farmer's knowledge on importance of adjusting dosages for different age classes and yield potential is inadequate.</li> </ul>
Particular Situation in Nachchaduwa Major Scheme and Thuruwila Medium Scheme		
	<ul style="list-style-type: none"> <li>Large proportion of farmers were either tenant or lease operators.</li> </ul>	<ul style="list-style-type: none"> <li>Low interest in building up organic status of soil for long term benefits by tenant and lease operators due to lack of land ownership and frequently changing lands.</li> </ul>
(3) Plant Protection	Common Points	
	<ul style="list-style-type: none"> <li>Application of IPM practices is mostly confined to demonstration plots.</li> <li>Poor adoption of the IPM practices following conclusion of field demonstrations, due to limitations of field visits by AIs have made monitoring and follow-up action needed to ensure effectiveness and continuity of the practices weak.</li> <li>Poor adoption of the IPM practices following field demonstrations.</li> <li>Farmers applied pesticides as a routine measure without consideration for pest populations and crop growth stage.</li> <li>High weed population in the field and bunds of paddy fields</li> </ul>	<ul style="list-style-type: none"> <li>Difficulty in applying IPM practices due to uncoordinated planting times and different age classes in the tract.</li> <li>Wasteful use of chemicals leading to development of pest resistance and environmental pollution.</li> <li>Limited use of cultural methods to contain weed growth.</li> </ul>
Particular Situation in Thuruwila Medium Scheme and Rajangana Major Scheme		
	<ul style="list-style-type: none"> <li>Efficacy of some agro-chemicals in the market was questionable.</li> </ul>	<ul style="list-style-type: none"> <li>Fraudulent labeling of chemicals stating incorrect expiry dates and concentrations.</li> </ul>

**Table B 4.1.1 Present Situation and Problems for Agricultural Sector (3/4)**

Category	Present Situation	Problems Description
(4) Harvest and Post Harvest	Common Points	
	<ul style="list-style-type: none"> <li>Harvesting is done manually.</li> <li>Farmers use many varieties with different growth duration.</li> <li>Some farmers tended to harvest before best reaping time (85% of grains in panicle turn golden brown) to take advantage of higher market prices early in the harvest period.</li> <li>Threshing is done using 4 wheel tractors, 2 wheel tractor (or engine) driven low capacity threshers or 4 wheel tractor driven high capacity thresher/seed cleaners, in the order of farmers preference.</li> <li>Due to logistic reasons, threshing of several adjoining farmers fields are contracted for threshing together</li> </ul>	<ul style="list-style-type: none"> <li>Poor quality of paddy due to high moisture content and low seed purity (mixing different variety).</li> <li>Losses due to early and late harvesting</li> <li>Limited availability of high capacity units in the study area.</li> <li>Lack of road access to field for high capacity units making farmers to use alternate methods for threshing.</li> </ul>
1.2 Production Cost		
(1) Labour	Common Points	
	<ul style="list-style-type: none"> <li>Shortage of hired labour for farm work</li> <li>Traditional labour exchange system (attam) is not practical in the present situation where cultivation is done according to crop calendar.</li> <li>Family labour contribution to farm work for study area is 1.7 mandays.</li> </ul> <p><u>Nachchaduwa</u> 51 mandays are used per ha of which 19 are hired at Rs. 400 per manday.</p> <p><u>Thuruwila</u> 51 mandays are used per ha of which 25 are hired at Rs. 350 per manday.</p>	<ul style="list-style-type: none"> <li>High cost of hired farm labour.</li> </ul>
(2) Fertilizers	Common Points	
	<ul style="list-style-type: none"> <li>Fertilizer dosage is below the recommended level due to high price other than urea.</li> <li>Applying the recommended dosage sometimes increase the production cost.</li> </ul>	<ul style="list-style-type: none"> <li>High price of fertilizer other than urea.</li> </ul>
(3) Agro Chemicals	Common Points	
	<ul style="list-style-type: none"> <li>Agro chemicals are imported and distributed by the private sector and there is no government subsidies offered.</li> <li>Agro-chemicals are regularly applied without IPM practice.</li> </ul>	<ul style="list-style-type: none"> <li>High price of agro-chemicals.</li> <li>High expenditure on agro-chemicals due to excessive usage from non adoption of IPM practices (<u>same problem as plant protection</u>).</li> </ul>
2. OFC, Fruit & Vegetable Production	Common Points	
	<ul style="list-style-type: none"> <li>Soil survey conducted in 3 pilot areas show that substantial land area is occupied by well to imperfectly drained Reddish Brown Earths (RBEs)</li> <li>The Agrarian Development Act No.46 of 2000</li> </ul>	<ul style="list-style-type: none"> <li>Non utilization of high potential RBE soils for production of cash crops.</li> <li>No written permission never issued against crop diversification in irrigated paddy lands.</li> <li>Monitoring and follow-up for field</li> </ul>

**Table B 4.1.1 Present Situation and Problems for Agricultural Sector (4/4)**

Category	Present Situation	Problems Description
	<p>states that paddy land can be utilized only for paddy cultivation, but written permission allows to cultivate other crops in paddy land.</p> <ul style="list-style-type: none"> <li>• Cultivation of vegetables and fruits (papaya and banana) under irrigation are more profitable than traditional paddy.</li> <li>• Field demonstration</li> </ul>	<p>demonstration is inadequate</p>
Particular Situation in Nachchaduwa Major Scheme		
	<ul style="list-style-type: none"> <li>• More than 60 ha of irrigated lands are cultivated mostly with vegetables, 22 ha of which are by an informal youth group.</li> <li>• The main vegetables cultivated are bitter gourd, snake gourd, eggplant, tomato, cucumber and sweet melon.</li> </ul>	<ul style="list-style-type: none"> <li>• Non regularization of the irrigated paddy land presently cultivated with seasonal and annual crops.</li> </ul>
3. Agricultural Extension Common Points		
	<ul style="list-style-type: none"> <li>• The annual implementation plan 2005/06 for implementation in each AI range targets a wide of activities.</li> <li>• Implementation, supervision, monitoring and follow up action on the progress of the field demonstrations are inadequate</li> <li>• Only 3 out of the 14 AIs in the Study area are using motorcycles to visit the field and operate on a restricted traveling allowance. All other AIs use public transport which has restricted their field visits considerably.</li> <li>• Training programs conducted for the farmers by the AIs, and SMOs are not effective. The AI center of Rajangana LB at ASC is provided with cyber extension facilities for use of farmers.</li> <li>• There is sometimes a delay in the transfer of new technologies developed at the research centers to the field extension staff</li> </ul>	<ul style="list-style-type: none"> <li>• Poor mobility of the AIs.</li> <li>• Lack of basic teaching aids and ineffective extension communication to improve the quality of training and presentations to farmers.</li> <li>• Lack of pre-seasonal training sessions for AIs on specific subjects that are relevant to the season to bridge the technology transfer gap.</li> <li>• Low sustainability of extension effects in farmers side due to lack of follow up and monitoring (<u>same problem as in productivity</u>).</li> </ul>
4. Other Farm Income Generating Activities Common Points		
	<ul style="list-style-type: none"> <li>• AI (IP DOA), VS and LDI (PDAP&amp;H), DO and ARPA (DAD), CDO/CDB, RPM (IMD), and sometimes, NGOs all providing services to the farmers tended to act independently, implementing their own line responsibilities.</li> <li>• Important sectors for income generation, namely issues on development of livestock and fisheries are identified in the Sector Development Plan 2006 – 2010, North Central Provincial Council.</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of coordination of the development activities of different agencies to avoid overlaps and deficiencies in the services provided specially</li> </ul>

## **4.2 Development Potential**

### **4.2.1 Basic Assumptions**

In order to establish the development potential of the Study area within the scope of the study, the following conditions are assumed to remain more or less at the same level as at present, namely, 1) government expenditure and the deployment of staff, except for short term investment of capacity development of field staff and FOs, 2) legal framework on irrigation, land and rural development, 3) price levels of agricultural inputs and products, including labour wages, and 4) socio-economic conditions in and around the Study area.

### **4.2.2 Paddy**

As mentioned above, the average profits generated per household from paddy cultivation are low. From an agricultural view point, any attempt to improve the profitability level should be associated with, a) expansion of the size of the farm holding, b) increasing the unit yield, and c) reduction of the cost of production.

#### **(1) Farm Size**

One approach to increase the household income would be to extend the scale of farm size by increasing the cultivated land area. Although there appears to be land consolidation towards expansion of the holding size, particularly in Nachchaduwa, the degree of such consolidation cannot be accurately estimated. Therefore, it is envisaged that the farm holding size would remain unchanged as at present. Under these circumstances, it is envisaged that any improvement in profitability of paddy should essentially be associated with increased productivity and reduced production costs.

#### **(2) Farming Practices**

Problems associated with improvement of farming practices has been described in the previous sections. The study of the present situation shows that the average yield of paddy in the Study area is around 4.6 – 5.0 t per ha. According to the data from socioeconomic survey of the pilot area, the unit yield ranged between 3.9 and 5.3 t per ha. However, in large scale field demonstrations, particularly the tract demonstrations under the GAP, yield levels of 6.0 t per ha have been achieved at tract level in some seasons, while some individual farmers have recorded unit yields beyond 6.5 t per ha. These high yield levels are attributed to adoption of improved farming practices.

Thus, there exists a gap between the actual average unit yields realized and the potential unit yields. Field demonstrations have already confirmed that significant increase in the yield could be achieved through improvements in the farming practices. The items that require particular attention in the improvement of farming practices may be summarized as, a) adherence to the cultivation schedule, b) use of high quality seed paddy both self seeds and replacement seeds, c) soil organic matter enrichment, d) deep plowing whenever possible, e) application of balanced fertilizers in adequate quantities based on the

anticipated crop yield, f) application of IPM practices, g) use of cultural methods for weed management, h) practice of proper harvesting procedures, and i) adoption of improved post harvest technologies. The benefits accrued from adoption of these improved methods have been well established and to some extent demonstrated in the farmers fields itself. Irrespective of the size of the farm holding, application of improved farming practices along with the divisible inputs have contributed towards high unit yields recorded. Improvements to the irrigation infrastructure and water management will no doubt complement the productivity of the land.

### (3) Anticipated Yield

In this regard, it is relevant to estimate the unit yields of paddy envisaged with project as against the yields under existing conditions. As there are no significant differences between the unit yield of paddy between seasons, an average value is used. Based on the available data from crop cutting surveys carried out under GAP by DOA and the Department of Census and Statistics, the anticipated unit yields for the 3 areas are estimated as follows.

**Table B 4.2.1 Anticipated Unit Yield With Project Condition**

(Unit: t/h)

Project Condition	Nachchaduwa	Thuruwila	Rajangana
Without Project	4.8	5.3	4.2
With Project	5.5	6.0	5.2
Percent Increase	14.6	13.2	23.8

Source: JICA Study Team.

### (4) Crop Budget and Farm Economy

Crop budget under the present conditions and one based on the estimated production costs and unit yield, that incorporates the standard DOA recommendations, and the gross income, for paddy in respect of the 3 study areas are shown in **Table B 4.2.2** and **Table B 4.2.3**, and summarized below.

**Table B 4.2.4 Crop Budget With and Without Project Condition**

(Unit: Rs/ha/season)

Item	Without Project			With Project		
	Nachchaduwa	Thuruwila	Rajangana	Nachchaduwa	Thuruwila	Rajangana
Gross Income	72,000	79,500	63,150	82,500	90,000	78,000
Material	15,435	11,960	11,330	17,575	16,885	16,545
Machinery	13,836	12,062	12,850	13,836	12,962	12,650
Labour	22,800	16,600	15,750	23,600	16,950	15,700
Total Cost	52,071	41,522	39,930	55,011	46,797	44,895
Net Income	19,029	37,987	23,220	27,489	43,203	33,105

Source: JICA Study Team.

Household economy is worked out on the basis of average farm holding size and the net



incomes and is presented in the Table below. Paddy reserved for household consumption and cost of capital have not been included in this computation.

**Table B 4.2.5 Household Paddy Income With and Without Project Condition**

(Unit: Rs)

Item	Without Project			With Project		
	Nachchaduwa	Thuruwila	Rajangana	Nachchaduwa	Thuruwila	Rajangana
Average Holding (ha)	1.10	0.91	0.65	1.10	0.91	0.65
Yield (kg/ha/season)	4,800	5,300	4,210	5,500	6,000	5,200
Prod. /HH/Y (kg)	10,560	9,646	5,473	12,100	10,920	6,760
Farm-gate Price (Rs)	15	15	15	15	15	15
Gross Income/HH (Rs)	148,500	144,690	82,095	181,500	163,800	101,400
Prod. Cost/holding	114,556	80,553	51,909	121,024	85,170	58,363
Net Income /HH (Rs)	33,944	64,137	30,186	60,476	78,630	43,037

**Table B 4.2.2 Crop Budget of Paddy Under Present Conditions**

Crop Description	Unit	Paddy: Nachchaduwa			Paddy: Thuruwila			Paddy: Rajangana		
		Rate	Qty	Val.Rs.	Rate	Qty	Val.Rs.	Rate	Qty	Val.Rs.
Yield	kg		4800			5300			4210	
Price	Rs/kg	15			15			15		
<b>Gross Revenue</b>				<b>72000</b>			<b>79500</b>			<b>63150</b>
<b>Cost of Production</b>										
Planting Materials										
Seeds	kg	28	103	2884	25	103	2575	18	110	1980
Fertilizer										
Basal	kg	32	100	3200	32	62	1984	32	63	2016
Urea	kg	13	187	2431	13	149	1937	13	124	1612
TDM	kg	18	105	1890	18	88	1584	18	44	792
Paddy Straw	kg		5000	0		5000	0		5000	0
Pesticides										
Weedicides	kg/l	520	6.5	3380	520	4	2080	520	6.5	3380
Insecticides	kg/l	520	2.5	1300	570	2.5	1425	520	2.5	1300
Fungicides	kg/l									
Other Materials										
Bags				350			375			250
<i>Material Cost</i>										
				15435			11960			11330
Machinery										
2W Tractor	times	3543	2	7086	3106	2	6212	3075	2	6150
Combine Thresher	times	6250	1	6250	6250	1	6250	6000	1	6000
Transport	sum			500			500			700
<i>Machinery Cost</i>										
				13836			12962			12850
Labour										
Land Preparation	md	400	11	4400	350	11	3850	350	13	4550
Sowing/Planting	md	400	10	4000	350	10	3500	350	6	2100
Fertilizing	md	400	3	1200	350	2	700	350	3	1050
Spraying	md	450	1	450	350	2	700	350	1	350
Weeding	md	450	1	450	350	1	350	350	2	700
Irrigation	md	400	20	8000	350	20	7000	350	20	7000
Harvesting Contract	md			10000			7500	350	23	8050
Threshing :Small	md									
:Combine	md	400	2	800	350	2	700	350	2	700
Winnowing	md									
Bagging/Transporting	md	400	3	1200	350	3	1050	350	3	1050
<i>Labour Cost with hired lab.</i>		400	51	30500	350	51	25350	350	73	25550
<i>Labour Cost with fam. lab.</i>		400	32	22800	350	26	16600	350	22	15750
<b>Total Cost of Production with hired labour</b>				<b>59771</b>			<b>50272</b>			<b>49730</b>
<b>Total Cost of Production with family labour</b>				<b>52071</b>			<b>41522</b>			<b>39930</b>
<b>Net Income with hired labour</b>				<b>12229</b>			<b>29228</b>			<b>13420</b>
<b>Net Income with Family labour</b>				<b>19929</b>			<b>37978</b>			<b>23220</b>

**Table B 4.2.3 Crop Budget of Paddy and Selected Vegetables With Project Condition (1/3)**

Crop Description	Unit	Paddy: Nachchaduwa				Paddy: Thuruwila				Paddy: Rajangana			
		Rate	Qty	Val.Rs.		Rate	Qty	Val.Rs.		Rate	Qty	Val.Rs.	
Yield	kg	5500				6000				5200			
Price	Rs/kg	15				15				15			
<b>Gross Revenue</b>		<b>82500</b>				<b>90000</b>				<b>78000</b>			
Cost of Production													
Planting Materials													
Seeds	kg	28	100	2800	2800	28	100	2800	2800	28	100	2800	2800
Suckers													
Nursery Management	sum												
Fertilizer													
Urea	kg	11	200	2200		11	200	2200		11	200	2200	
TSP	kg	34	90	3060		34	90	3060		34	90	3060	
MOP	kg	32	75	2400		32	75	2400		32	75	2400	
Zinc Sulphate	kg	80	0	0		80	0	0		80	0	0	
Cowdung	kg												
Green Manure	kg												
Husk Charcoal	kg	0.5	750	375		0.5	750	375		0.5	750	375	
Paddy Straw	kg	5000		0		5000		0		5000		0	
Pesticides													
Weedicides	kg/l	520	6.5	3380		520	4	2080		500	4	2000	
Insecticides	kg/l	520	2.5	1300		570	3	1710		550	3	1650	
Fungicides	kg/l												
Other Materials													
Trellising	sum												
Bags		1000				1200				1000			
<b>Material Cost</b>		<b>13715</b>				<b>13025</b>				<b>12685</b>			
Machinery													
2W Tractor	times	3543	2	7086		3106	2	6212		3075	2	6150	
4W Tractor	times												
Back-hoe	times												
Hand Sprayer	times												
Small Thresher	times												
Combine Thresher	times	6250	1	6250		6250	1	6250		6000	1	6000	
Transport	sum	500				500				0			
<b>Machinery Cost</b>		<b>13836</b>				<b>12962</b>				<b>12150</b>			
Labour													
Land Preparation	md	400	11	4400		350	13	4550		350	10	3500	
OM Addition	md	400	1	400		350	1	350		350	1	350	
Seed Preparation	md												
Sowing/Planting	md	400	10	4000		350	10	3500		350	11	3850	
Trellising	md												
Fertilizing	md	400	3	1200		350	3	1050		350	3	1050	
Spraying	md	400	1	400		350	1	350		350	1	350	
Weeding	md	400	1	400		350	1	350		350	1	350	
Irrigation	md	400	20	8000		350	20	7000		350	20	7000	
Harvesting Contract	md	10000		10000		7500		7500		8000		8000	
Threshing :Small	md												
:Combine	md									350	2	700	
Winnowing	md												
Bagging/Transporting	md	400	4	1600		350	2	700		350	3	1050	
<b>Labour Cost with hired lab.</b>		400	52	30400		350	52	25350		350	53	26200	
<b>Labour Cost with fam. lab.</b>		400	34	23600		350	27	16950		350	22	15700	
<b>Total Cost of Production with hired labour</b>		<b>60751</b>				<b>54137</b>				<b>53835</b>			
<b>Total Cost of Production with family labour</b>		<b>53951</b>				<b>45737</b>				<b>43335</b>			
<b>Net Income with hired labour</b>		<b>21749</b>				<b>35863</b>				<b>24165</b>			
<b>Net Income with Family labour</b>		<b>28549</b>				<b>44263</b>				<b>34665</b>			

**Table B 4.2.3 Crop Budget of Paddy and Selected Vegetables With Project Condition (2/3)**

Crop Description	Unit	Bitter Gourd			Eggplant			Sweet Pumpkin			
		Rate	Qty	Val.Rs.	Rate	Qty	Val.Rs.	Rate	Qty	Val.Rs.	
Yield	kg		20000			17000			20000		
Price	Rs/kg	20			20			14			
<b>Gross Revenue</b>				<b>400000</b>			<b>340000</b>			<b>280000</b>	
Cost of Production											
Planting Materials											
Seeds	kg	4000	6	24000	4000	0.35	1400	3000	1	3000	
Suckers											
Nursery Management	sum						2000				
Fertilizer											
Urea	kg	11	300	3300	11	300	3300	11	300	3300	
TSP	kg	34	200	6800	34	325	11050	34	200	6800	
MOP	kg	32	180	5760	32	170	5440	32	180	5760	
Zinc Sulphate	kg										
Cowdung	kg	1	5000	5000	1	2000	2000	1	2000	2000	
Green Manure	kg	1	2500	2500							
Husk Charcoal	kg	0.5	1000	500	0.5	1000	500				
Paddy Straw	kg	0.5	5000	2500	0.5	5000	2500	0.5	5000	2500	
Pesticides											
Weedicides	kg/l	500	4	2000	500	4	2000	500	4	2000	
Insecticides	kg/l	4500	0.5	2250	600	3	1800	600	4	2400	
Fungicides	kg/l										
Other Materials											
Trellising	sum			20000							
Bags		20	500	10000	20	400	8000				
Material Cost				84610			39990			27760	
Machinery											
2W Tractor	times	3500	2	7000	3500	2	7000	3500	1	3500	
4W Tractor	times										
Back-hoe	times										
Hand Sprayer	times										
Small Thresher	times										
Combine Thresher	times										
Transport	sum			20000			17000			20000	
Machinery Cost				27000			24000			23500	
Labour											
Land Preparation	md	400	37	14800	400	35	14000	400	35	14000	
OM Addition	md	400	4	1600	400	4	1600				
Seed Preparation	md										
Sowing/Planting	md	350	10	3500	400	15	6000	350	8	2800	
Trellising	md	350	25	8750							
Fertilizing	md	350	48	16800	350	64	22400	350	22	7700	
Spraying	md	450	40	18000	450	30	13500				
Weeding	md	350	60	21000	350	60	21000	350	30	10500	
Irrigation	md	350	20	7000	350	20	7000	350	12	4200	
Harvesting Contract	md	300	54	16200	350	48	16800	350	30	10500	
Threshing :Small	md										
:Combine	md										
Winnowing	md										
Bagging/Transporting	md	400	30	12000	400	22	8800	350	20	7000	
Labour Cost with hired lab.		350	328	119650	350	298	111100	350	157	56700	
Labour Cost with fam. lab.		350	298	104300	350	268	93800	350	127	44450	
<b>Total Cost of Production with hired labour</b>				<b>231260</b>			<b>174265</b>			<b>104635</b>	
<b>Total Cost of Production with family labour</b>				<b>215910</b>			<b>156965</b>			<b>92385</b>	
<b>Net Income with hired labour</b>				<b>168740</b>			<b>165735</b>			<b>175365</b>	
<b>Net Income with Family labour</b>				<b>184090</b>			<b>183035</b>			<b>187615</b>	

**Table B 4.2.3 Crop Budget of Paddy and Selected Vegetables With Project Condition (3/3)**

Crop Description	Unit	Maize			Cabbage			Banana		
		Rate	Qty	Val.Rs.	Rate	Qty	Val.Rs.	Rate	Qty	Val.Rs.
Yield	kg		5000			40000			15000	
Price	Rs/kg	17.5			10			25		
<b>Gross Revenue</b>				<b>87500</b>			<b>400000</b>			<b>375000</b>
Cost of Production										
Planting Materials										
Seeds	kg	300	5	1500	33700	0.25	8425			
Suckers								30	1300	39000
Nursery Management	sum						3000			
Fertilizer										
Urea	kg	11	200	2200	11	400	4400	11	800	8800
TSP	kg	34	120	4080	34	275	9350	34	540	18360
MOP	kg	32	75	2400	32	150	4800	32	1350	43200
Zinc Sulphate	kg									
Cowdung	kg				1	5000	5000	1	5000	5000
Green Manure	kg				1	2500	2500			
Husk Charcoal	kg				0.5	1000	500			
Paddy Straw	kg	0.5	5000	2500	0.5	5000	2500	0.5	5000	2500
Pesticides										
Weedicides	kg/l	500	4	2000	500	4	2000	500	10	5000
Insecticides	kg/l				1500	6	9000			
Fungicides	kg/l				1000	6	6000			
Other Materials										
Trellising	sum									
Bags		20	75	1500	20	800	16000			
<i>Material Cost</i>				16180			73475			121860
Machinery										
2W Tractor	times	3500	1	3500	3500	2	7000	2500	1	2500
4W Tractor	times									
Back-hoe	times									
Hand Sprayer	times									
Small Thresher	times									
Combine Thresher	times									
Transport	sum						40000			15000
<i>Machinery Cost</i>				3500			47000			17500
Labour										
Land Preparation	md	400	25	10000	400	55	22000	400	65	26000
OM Addition	md				400	4	1600			
Seed Preparation	md									
Sowing/Planting	md	350	15	5250	350	15	5250	400	20	8000
Trellising	md									
Fertilizing	md	350	20	7000	350	64	22400	400	36	14400
Spraying	md				400			400	2	800
Weeding	md	350	15	5250	350	60	21000	350	48	16800
Irrigation	md	350	6	2100	350	20	7000	350	72	25200
Harvesting Contract	md	350	10	3500	350	30	10500	400	25	10000
Threshing :Small	md	350	8	2800						
:Combine	md									
Winnowing	md									
Bagging/Transporting	md	350	8	2800	350	20	7000	400	20	8000
<i>Labour Cost with hired lab.</i>		350	107	38700	350	268	96750	400	288	109200
<i>Labour Cost with fam. lab.</i>		350	77	26950	350	238	83300	400	258	103200
<b>Total Cost of Production with hired labour</b>				<b>58380</b>			<b>217225</b>			<b>248560</b>
<b>Total Cost of Production with family labour</b>				<b>46630</b>			<b>203775</b>			<b>242560</b>
<b>Net Income with hired labour</b>				<b>29120</b>			<b>182775</b>			<b>126440</b>
<b>Net Income with Family labour</b>				<b>40870</b>			<b>196225</b>			<b>132440</b>

### 4.2.3 Other Crops

Soil survey carried out in the pilot areas shows that an appreciable land extent in the command area in Nachchaduwa and Rajangana schemes is occupied by well to imperfectly drained Reddish Brown Earths (RBEs) represented by 23% and 37%, respectively. These soils are better suited for cultivation of crops other than paddy. Besides paddy, the main crops presently grown in the area under irrigation consists of vegetables and banana. Papaya and maize are also observed to a lesser extent. Cultivation of such crops are much more profitable than growing of paddy. Crop budgets of selected vegetables common in the area and that of banana are shown in **Table B 4.2.3**

As apparent from the crop budgets presented, the capital investment and labour requirement for vegetables cultivation are very high and stable market conditions do not prevail. Because of these reasons and their high susceptibility to adverse weather conditions have made them high risk crops. According to the surveys carried out in the area, capital and labour are scarce resources and the existing market structure does not support diversification. Further, there are the legal barriers that restrict cultivation of crops other than paddy in the irrigated lands under large irrigation schemes, particularly with perennial crops. Banana and papaya too are considered perennials as they occupy the land for several years. Because of these reasons, only the natural shift towards diversification of paddy lands is envisaged under with project condition. In this regard, Nachchaduwa has already shown a relatively higher degree of diversification of the irrigated lands with some 17% of the pilot area being cultivated with vegetables, and to a lesser extent with banana. Around 10 – 11% of the irrigated land in Rajangana are cropped with banana and papaya, while little diversification is recorded in Thuruwila. Because Nachchaduwa is located close to major towns and vegetable wholesale market at Dambulla, it is expected that process of diversification into vegetables will continue, particularly in the Yala season, if the market situation is improved. An additional reason to support this trend is the inadequacy in available water to irrigate the entire command area during some Yala seasons. Study of the cropping intensity during the past 13 – 15 years show that on average only 44% of the command area of 2,635 ha had been cultivated during the Yala season. The variation in the extents cultivated in the two cropping seasons is not significant in Thuruwila and Rajangana schemes.

## 4.3 Basic Approach for Improvement

### 4.3.1 General

The conceptual flow of the Study envisages identification of problems and issues in the sector through field surveys, data collection and analysis, direct observations and problem analysis workshops to develop basic sectoral approach for development. The improvement approaches of the three sectors, namely irrigation, agriculture and marketing will form the base for the formulation of the capacity development plan.

#### 4.3.2 Present Situation and Problems and Approach

Based on the problems identified (**Table B 4.1.1**), a study was made to identify causes for the problems and to propose countermeasures that would rectify the situation. The basic approach for improvement, that was developed addressing the problem causes and countermeasures, is shown in **Table B 4.3.1**

The capacity development approach for the agriculture sector, prepared on a matrix showing the intricate relationships that exist between problems, causes, countermeasures, and approaches along with target group, implementer and training courses is presented **Figure B 4.3.1**.

**Table B 4.3.1 Problems and Approach for Agriculture Sector (1/3)**

Agriculture

Category	Problem Description	Approach	Target Group
1. Paddy Production	Common Points		
1.1 Productivity			
1.1 Productivity	<ul style="list-style-type: none"> <li>• Low sustainability of yield</li> </ul>	<ul style="list-style-type: none"> <li>(i) Empowerment of farmer groups to improve access to inputs, credit and machinery through capacity development (demonstration with facilitation).</li> <li>(ii) Capacity development of officers to play the role of facilitator to farmer groups, and monitoring &amp; evaluation in the demonstration.</li> </ul>	<ul style="list-style-type: none"> <li>(i) Farmer groups and FOs</li> <li>(ii) DOA, DAD, IMD</li> </ul>
(1) Seed Quality	<ul style="list-style-type: none"> <li>• Inadequate knowledge of farmers in self seed production</li> <li>• Shortage of quality seed paddy</li> </ul>	<ul style="list-style-type: none"> <li>(i) Establishment and operation of seed production farms managed by farmer groups to produce secondary and certified seeds to serve each FO area, through facilitation of group formation.</li> <li>(ii) Training farmers on the technology of self seed production.</li> </ul>	<ul style="list-style-type: none"> <li>(i) Farmer groups and FOs., DOA, IMD</li> <li>(ii) Farmer groups and FOs</li> </ul>
(2) Plant Nutrition	<ul style="list-style-type: none"> <li>• Soil degradation</li> </ul>	<ul style="list-style-type: none"> <li>(i) Awareness against burning of paddy straw through awareness training (demonstration with facilitation).</li> <li>(ii) Making straw recycling a condition for fertilizer subsidy entitlement (demonstration with facilitation).</li> </ul>	<ul style="list-style-type: none"> <li>(i) Farmers group, FOs, DAD</li> <li>(ii) FOs, DAD</li> </ul>
	<ul style="list-style-type: none"> <li>• Inadequate knowledge on fertilizer levels</li> </ul>	<ul style="list-style-type: none"> <li>(i) Awareness training of farmers to fertilizer applications on crop duration and crop output (demonstration with facilitation).</li> </ul>	<ul style="list-style-type: none"> <li>(i) Farmer groups and FOs.</li> </ul>
(3) Plant Protection	<ul style="list-style-type: none"> <li>• Difficulty of applying IPM practices</li> <li>• Waste use of chemicals</li> </ul>	<ul style="list-style-type: none"> <li>(i) Facilitation for planting paddy of same age class at the same time in the tract. (demonstration with facilitation).</li> <li>(ii) Awareness training of farmers on proper use of pesticides. (demonstration with facilitation).</li> </ul>	<ul style="list-style-type: none"> <li>(i) DOA, DAD</li> <li>(ii) Farmer groups and FOs.</li> </ul>
	<ul style="list-style-type: none"> <li>• Waste Use</li> </ul>	<ul style="list-style-type: none"> <li>(i)</li> </ul>	<ul style="list-style-type: none"> <li>(i) DOA</li> </ul>
	<ul style="list-style-type: none"> <li>• Non use of cultural methods for weed control</li> </ul>	<ul style="list-style-type: none"> <li>(i) Farmer training to popularize use of cultural methods for weed control and reduce herbicide application. (demonstration with facilitation)</li> </ul>	<ul style="list-style-type: none"> <li>(i) DOA</li> </ul>



**Table B 4.3.1 Problems and Approach for Agriculture Sector (2/3)**

Category	Problem Description	Approach	Target Group
(4) Harvest and Post-harvest	<ul style="list-style-type: none"> <li>Poor quality of paddy</li> <li>Loses in harvest</li> </ul>	(i) Awareness programs on proper harvesting procedures to minimize grain losses and improve the quality. (demonstration with facilitation)	(i) Farmer groups and FOs, DOA, IPHT
	<ul style="list-style-type: none"> <li>Limited number of high capacity thresher units</li> </ul>	(i) Facilitate farmers, FOs and private sector to secure and increase the number of units in the area, with assistance of banks for credit.	(i) DOA, DAD, IMD
1.2 Production Cost	<ul style="list-style-type: none"> <li>High cost of labour</li> </ul>	(i) Assessment of applicability of mechanization of farm operations, particularly harvesting, through introduction of combine harvesters. (ii) Facilitate securing combine harvesters by farmers, FOs and the private sector through bank loans.	(i) DOA, Farm Mechanization Centre,  (ii) Mahailuppallama
	<ul style="list-style-type: none"> <li>High cost of fertilizers</li> </ul>	(i) Facilitation to form farmers group for bulk purchase.	(i) Farmers, DOA, DAD, IMD
	<ul style="list-style-type: none"> <li>High cost of agro-chemicals</li> </ul>	Same approach as plant protection	Same as plant protection
2. OFC, Fruit & vegetables	Common Points		
2.1 OFC, Fruit & vegetables	<ul style="list-style-type: none"> <li>Non-utilization of RBE soils suitable for crop diversification</li> </ul>	(i) Soil survey, preparation of soil maps, dissemination to farmers	(i) Farmers, DOA, DAD, IMD
	<ul style="list-style-type: none"> <li>Restriction by law for other profitable crop</li> </ul>	(i) Discuss legal and socio-economic implications in releasing irrigated paddy lands having Reddish Brown Earths for crop diversification.	(i) Commissioner General of DAD, GA, DOI
	<ul style="list-style-type: none"> <li>Inadequate monitoring and follow-up for demonstration.</li> </ul>	Same approach as paddy productivity (demonstration and facilitation)	Same as paddy productivity
3. Agricultural Extension	Common Points		
3.1 Agricultural Extension	<ul style="list-style-type: none"> <li>Poor mobility of AIs</li> </ul>	(i) Establish a revolving fund to providing the AIs with loans to purchase motorcycles for official field traveling.	(i) AIs of DOA
	<ul style="list-style-type: none"> <li>Lack of teaching aid.</li> </ul>	(i) Preparing and providing the AI offices in ASCs with a package of teaching aid.	(i) AIs of DOA
	<ul style="list-style-type: none"> <li>Lack of training of AIs on season specific subject areas</li> </ul>	(i) Commence a regular pre-seasonal training program for AIs and other agricultural staff at a relevant In-service Training Institute of the DOA. (ii) Arranging a training program in a foreign country in the region for	(i) AIs, AO of DOA  (ii) DOA

**Table B 4.3.1 Problems and Approach for Agriculture Sector (3/3)**

Category	Problem Description	Approach	Target Group
		a senior staff member of the DOA to gain experience on agricultural extension aspects in a large settlement project.	
4. Other Farm Income Generating Activities	Common Points		
	<ul style="list-style-type: none"> <li>Poor coordination of development activities</li> </ul>	(i) Making participation of officers of DOA, PDAP&H, DAD, NGO and any other organization involved in development activities in the Project Committee Management meetings.	FO, DOA, PDA&H, DAD, NGO

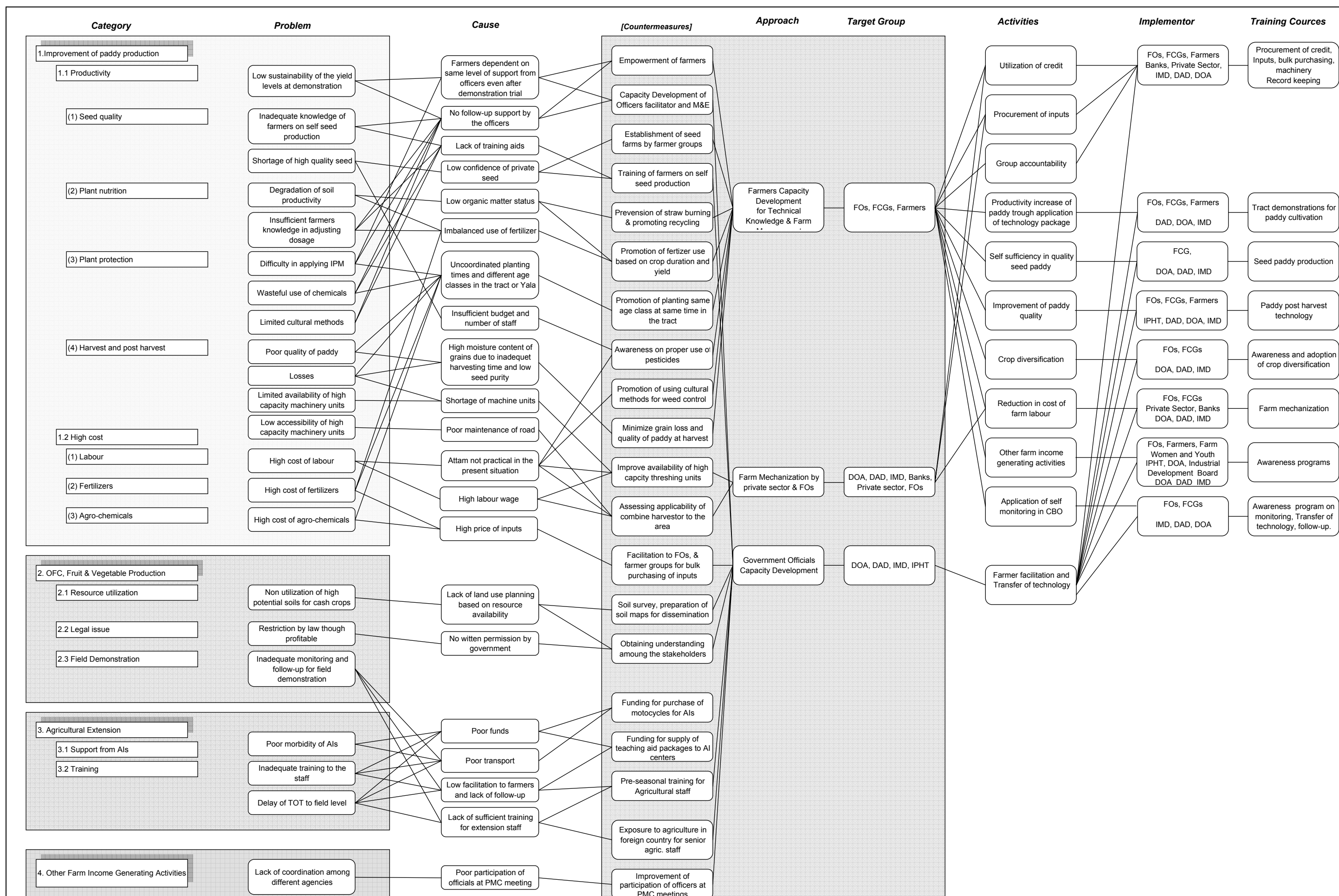


Figure B 4.3.1 Capacity Development Approach for Agriculture Sector

*Attachment*

*Attachment B1*

*Farm Economic Survey  
Questionnaire*



**3.2 House**

Rooms	Roof	Walls	Floor	Toilet	Electricity	Water

**3.3 Farm Machinery & Equipment (Nos.)**

4W tractor	2W tractor	Thresher	Sprayer	W. pump	Trailer	

**3.4 Home Appliances (Nos.)**

TV	Radio	Phone	Sew Mach		

**3.5 Transport (Nos)**

Car/van	Truck	Mobike	Pushbike		

**3.6 Processing Machinery**

	Rice mill	Food Processing: DESCRIBE	Other
Capacity			

**3.7 Farm Buildings**

	Paddy Storage	Food Processing	Other (specify)
Capacity			

**3.8 Livestock**

Buffalo	Cattle	Poultry	Goat	Pig		

**4 Homegarden**

Perennials	No. of Trees	Production		Unit price Rs.	Qty Sold
		Unit	Qty		
Coconut					
Banana					
Mango					
Drumstick					
Jak					
Teak					
Neem					
Other Crops					

**5 Crop Production**

Crop	Yala Season		Maha Season		Reserves for	
	Extent ha	Prodn. Mt	Extent ha	Prodn. Mt	Consumpn	Seed
Paddy						

4.1 Settlement of rents and loans in kind: (kg)

Tenency	<input type="text"/>	Chemicals	<input type="text"/>	Total	<input type="text"/>
Lease	<input type="text"/>	Fertiliers	<input type="text"/>		

**6 Household Income**

Source	Rupees	perM/S/Y	
Crops			
Paddy			
Fruits			
Vegetables			
Coconut			
Field crops			
Livestock			
Milk			
Eggs			
Poultry			
Pig/Goat			
Off Farm Income			
Cottage Industry			
Hire of Machinery			
Milling			



Selling Finished Products			
Trading			
Money Lending			
Sanurdhi			
Hired Labour			
Other (specify)			

**7 Household Expenditure**

	Rupees	perM/S/Y	
Payment of Interest			
Food and Beverages			
Clothing			
Transport			
Functions			
Health			
Education			
Entertainment			
Other (specify)			

**8 Loans Obtained This Year 2005**

Purpose	Month or Season	Source		Amount	Paid	Interset
		1	2			

Do you have unsettled loans that were taken last year or before ?

If YES, what is the outstansing amount ?

**9 Where do you sell your surplus produce ?**

Crop	Point of Sale	Unit	Quantity	Unit Price

**10 Do you hold membership in rural organizations ?**

Organization	Position Held	Membership Fee

**11 What benefits do you get by being a member of the Farmer Organization ?**

**12 Observations**

Date

Name of Interviewer

## *Attachment B2*

### *Guide to Semi-structured Questionnaire Questionnaire of Group Survey: Agricultural Practices and Costs*

Guide to Semi-structured Questionnaire

QUESTIONNAIRE OF GROUP SURVEY: Agricultural Practices and Costs

1 Varieties of Paddy Cultivated in the area:

1.1 Varieties in order of usage (if possible)

--	--	--	--	--

1.2 Cost of seeds Rs/kg

--	--

1.3 Source

--

--

--

2 Seed Treatment Practices:

Description:

Mandays

--

3 Land Preparation:

3.1 Activities prior to ploughing operation

1 General land clearing Operation

	mandays
--	---------

2 Weedicide application

Chemical	Cost	Source	Timing	Mandays	Description:

3.2 Machinery and Equipment Used:

1 Machine

2 W Tr	4 W Tr	buffolo	neat cattle	Description
--------	--------	---------	-------------	-------------

2 Equipment

Mould B	Disc	Tyne	Rotovator	
---------	------	------	-----------	--

3 No of times

1st plough	2nd plough	3ed plough	levelling	
------------	------------	------------	-----------	--

4 Cost per operation

--	--	--	--	--

5 Labour used mandays

--	--	--	--	--

4 Sowing

4.1 Activities at Sowing Time

Mandays	Description
---------	-------------

1 Bund cleaning and plastering

--	--

2 Seed bed preparation

--	--

3 Sowing

--	--

4 Seed rate kg/ha

--

5 Fertilizing

5.1 Basal Application

1 Mixed or straight

--

2 Quantity

--

3 Time of application

--

4 Cost

--

5 Mandays

--

5.2 1st Top Dressing

1 Quantity

--

2 Time of application

--

3 Cost

--

4 Mandays

--

5.3 2nd Top Dressing

1 Quantity

--

2 Time of application

--

3 Cost

--

4 Mandays

--

5.3 Final Top Dressing TDM

1 Mixed or straight

--

2 Quantity

--

3 Time of application

--

4 Cost

--

6 Pest and Disease Control

6.1 Pests

1 Common pests

	cost
--	------

2 Chemicals used

a		
b		
c		

3 Sprayer

--

4 Instructions/advise

--

5 No. of times

--

6 Mandays

--

6.2 Diseases

1 Common diseases

	cost
--	------

2 Chemicals used

a		
b		
c		

3 Sprayer

--

4 Instructions/advise

--

5 No. of times

--

6 Mandays

--

7 Weed Control

Describe 6 and 7

7.1 Common weeds

1 Cultural methods

1 Common pests

2 Chemicals used

	cost
a	
b	
c	

--

3 Sprayer

4 Instructions/advise

5 No. of times

6 Mandays

8 Irrigation

Describe:

Mandays

(per rotation)

--

9 Harvesting:

Describe

9.1 Timing

9.2 Method

9.3 Heaping

9.4 Drying

9.5 Mandays

9.6 Cost


--

10 Post Harvest:

10.1 Threshing

1 Method

2 Cost

3 Mandays

Buffalo	4 W Tr	Thresher	Big Thresh

10.2 Winnowing

1 Method

2 Cost

3 Mandays

Fan	Wind

10.3 Bagging

11 General

11.1 Credit

Amount	Source	Comment

11.2 Extension

No. Visits	No Contact	Comment

11.3 Marketing

Qty Sold	To Whom	Price	Comment

***Attachment B3***

***Questionnaire  
Agricultural Instructors/SMOs/Segment AO***

Questionnaire

**AGRICULTURAL INSTRUCTORS/SMOs/Segment AO**

Please write down your comments: (a) in order of relative importance  
(b) in Sinhala or English

Name \_\_\_\_\_ Age (Yrs) \_\_\_\_\_ Range \_\_\_\_\_  
Segment \_\_\_\_\_ Scheme \_\_\_\_\_

Professional Qualifications

	Institution	Qualification	Year
1			
2			
3			

Years of Service as an Agricultural Instructor

Years of Service in the District

Mode of Transport  Off.Vehicle  Mobike  Pub. Trans

In-Service and Other Training

YEAR 2004

	Name of the Program	Institution & Country	Period (Y/M/D)
1			
2			
3			
4			
5			
6			

YEAR 2005

	Name of the Program	Institution & Country	Period (Y/M/D)
1			
2			
3			
4			
5			
6			

Do you think the present training programs are adequate to carry out your services satisfactorily ?

Yes  No

If NO, what are the subject areas that you think need strengthening by further training ?

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_
- 3 \_\_\_\_\_
- 4 \_\_\_\_\_
- 5 \_\_\_\_\_

What are the major problems or difficulties you face in carrying out your usual duties ?

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_
- 3 \_\_\_\_\_
- 4 \_\_\_\_\_
- 5 \_\_\_\_\_

In your view, what the major problems or difficulties the farmers in your area face in carrying their farming practices

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_
- 3 \_\_\_\_\_
- 4 \_\_\_\_\_
- 5 \_\_\_\_\_