

APPENDIX - M

Present Condition of Priority Irrigation Schemes

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APPENDIX - M PRESENT CONDITION OF PRIORITY IRRIGATION SCHEMES

Chapter 1 LOCATION AND ADMINISTRATIVE DIVISIONS

The Project for the Feasibility Study covers 5 irrigation schemes; i) Nachchaduwa major irrigation scheme, ii) Palukadawela major irrigation scheme, iii) Periyakulama medium irrigation scheme, iv) Mahananneriya medium irrigation scheme, and Mahananneriya minor irrigation schemes (cascade) consisting of 6 minor schemes. These schemes fall within the two districts of Kurunegala and Anuradhapura, and consist of following three Divisional Secretariats (DS) and 36 Grama Niladharis (GN).

Administrative Divisions of the Project Area

Schemes	Districts	Divisional Secretariat (DS)	Grama Niladhari (GN)
Nachchaduwa Major Irrigation Scheme	Anuradhapura	Nachchaduwa	5 Ala Srawastipura, Srawasti Watta, Amane, Diuluwewa, Kuda-nelbewa, Maha-nelbewa, Pawakkulama, Kaluarachchiyagama, Pahalawewa, (Turuwila), Heta-ala (Hidogama), Suhadagama, Madawalagama, Kalawila North, Nachchaduwa, Nachchaduwa Town, Palayakulama
Palukadawela Major Irrigation Scheme	Kurunegala	Galgamuwa	Jayabima, Aluth Herathgama, Mottapeththawa, Karuwalgaswewa, Ihala Palukandawa, Pahala Palukandawa, Konwewa, Ganedirulwewa, Kattakaduwa, Wadugama, Kurundewa, Palukadawala
Periyakulama Medium Irrigation Scheme	Anuradhapura	Tirappane	Wanamalu Uyana
Mahananneriya Medium Irrigation Scheme	Kurunegala	Galgamuwa	Mahananneriya North Mahananneriya South
Mahananneriya Minor Irrigation Schemes (Cascade)	Kurunegala	Galgamuwa	Kallanchiya, Ihalapalukandawa, Ihalagama, Ihalananneriya

The Nachchaduwa major scheme is located in the southern part of Anuradhapura (see Location Map). The Periyakulama medium scheme lies halfway between Anuradhapura and Dambulla. The three schemes of Palukadawela major, Mahananneriya medium and Mahananneriya minor schemes are situated in the southern and western parts of the Galgamuwa town which lies midway between Anuradhapura and Kurunegala. The national roads (A10, A28, A9 and A6) which connect these major towns run near the schemes.

Chapter 2 NATIONAL CONDITION

2.1 Topography and Geology

2.1.1 Topography

Nachchaduwa Basin

The general landscape is an undulating peneplain with erosional remnants that result from wind and rain during prolonged periods. Ritigala hill, a Strict Nature Reserve (SNR), is situated about 15 km south-east of Nachchaduwa Tank, it is the highest point in the catchment. The two main rivers flowing through the catchment, the Malwatu Oya and Maminiya Oya, originate mainly from this hill and traverse gradual slopes between natural and degraded Dry Zone forested areas, settlements and plantations before they confluence and continue as the Malwatu Oya feeding Nachchaduwa Tank.

Mi Oya Basin

The basin areas are featured by thin soils and scattered hillocks over the lowest peneplain, and stretches towards the north-west coast. The Palukadawela Tank is located at a rocky ridge in the landscape, where the Mi Oya flows into the middle of the catchment, while the Maha Nanneriya as well as the Maha Nanneriya minor schemes are in a valley formed by the Nanneriya Oya, a tributary of the Mi Oya.

2.1.2 Geology

Nachchaduwa Basin

The geological structures of Sri Lanka consists predominantly of crystalline rock which can be subdivided into three main rock types: the Highland Series, the South-western group, and the Vijayan Complex. Nachchaduwa Tank and Periyakulama Tank is situated entirely in the Highland Series which is composed of charnokite, charnokitic gneisses and metamorphosed sediments formed from the transformation of rocks under pronounced changes in temperature, pressure, and the chemical environment. The main part of the tank is placed within charnokite gneiss, bordered on the west by the undifferentiated Highland Series.

Mi Oya Basin

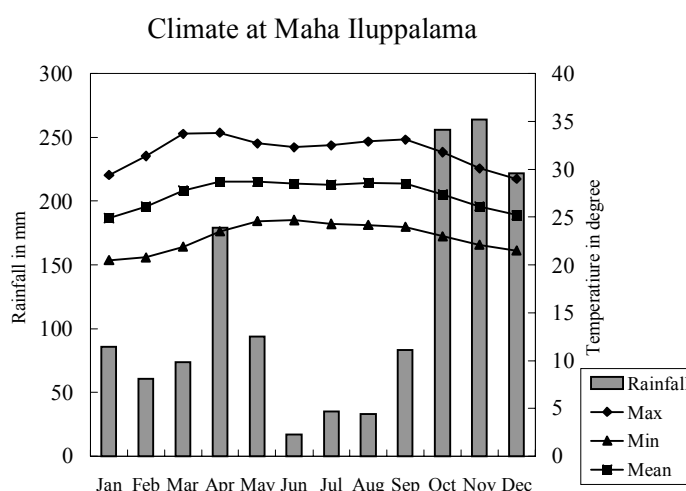
Four major geological formation are present in the Mi Oya Basin, namely, Highland Series in the east (mainly quartzite, undifferentiated metasediments, and gneisses), Vijayan Complex in the mid-catchment (granitic and biotite gneiss), Jurassic Rocks around Tabbowa reservoir, and Quaternary Deposits along rivers

and in the delta (river and estuarine clay, silt and sand, and red and red-brown earths). The geology of the Palukadawela Tank site is featured by undifferentiated metasediments of Vijayan Complex overlaid with alluvial deposit of Quaternary Deposit while Granitic Gneiss of Vijayan Complex overlaid by Quaternary Deposit is observed in the Maha Nanneriya as well as the Maha Nanneriya minor schemes.

2.2 Meteorology and Hydrology

2.2.1 Meteorology

The main rainfall period, i.e. October and November, coincides with the start of the Maha cultivation season (October to April). The second rainfall period is centred around April and lasts about two months. The latter marks the commencement of the Yala cultivation season (April to October).



All schemes lies between the 1,250 – 1,500 mm isohyets of mean annual rainfall and falls within the Dry Zone Agro-Ecological Region DL1, which means that at least an amount of 775 mm can be expected annually in three out four years.

Monthly and annual rainfall data for meteorological stations around the schemes are summarised below.

Mean Monthly Rainfall

Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Nachchaduwa	75	47	59	151	80	10	30	37	53	214	225	186	1,167
Anuradhapura	94	52	67	163	90	13	33	36	68	244	242	207	1,308
Maha Iluppalama	85	61	74	179	94	17	35	33	83	256	264	222	1,398
Galgamuwa	74	48	84	195	91	31	34	27	66	273	245	189	1,356

The average annual rainfall recorded at Nachchaduwa Tank for the period 1950 – 1999 was 1,167 mm. In comparison, at the nearest Meteorological Department station situated within Anuradhapura City, the average annual rainfall during the period 1950 – 1999 was 1,308 mm. In Anuradhapura, the highest annual rainfall of 2,427 mm for the period was recorded in 1957.

Mean monthly temperature records at mid-day at Anuradhapura during the period 1950 – 1999 was 28.0°C with the lowest value of 25.4°C for January and the highest value of 29.2°C for April. The daily variation in temperature may be as high as 9°C which exceeds the annual range of variation of the mean monthly values measured at mid-day. The monthly maximum temperatures recorded for Maha Iluppallama for 1953 – 1999 show that the highest value, 33.8°C, was recorded in April while the lowest, 29.0°C, occurred in December. The monthly minimum temperatures show that the lowest, 20.5°C occurred in January while the highest minimum temperature of 24.7°C was recorded in June.

2.2.2 Hydrology

Nachchaduwa Basin

The Nachchaduwa tank impounds the waters of Malwatu Oya and Maminiya Oya both of which originate mainly from the Ritigala mountain range and confluence about 5 km east of the tank.

The specific yield from the Malwatu Oya basin is about 0.4 million m³/km² during the Maha season (October to April) and 0.06 million m³/km² during the Yala season (April to October), while the annual average is 0.5 million m³/km². The catchment of Nachchaduwa Tank, which consists of a part of the Malwatu Oya basin, is about 608 km² with a mean annual runoff about 1,088 m³/s.

Inflow into Nachchaduwa Tank occurs by way of the Maminiya Oya and Malwatu Oya, both originate mainly in the Ritigala SNR, confluence, and then continue as the Malwatu Oya. Inflow into the tank is automatically controlled by the tanks that impound the waters of the Maminiya Oya, and the cascade of minor tanks in the catchment and draw off for irrigation. The Malwatu Oya has not been impounded, however, its main tributary, the Maminiya Oya is straddled by the restored Eru Wewa a few miles upstream of Nachchaduwa Tank and by Mananketiya Tank further upstream.

Segments of the two main rivers have discrete names. The Kaluebe Ela, which originates from the eastern slopes of the SNR, flows through a number of small tanks before it feeds the Mananketiya Tank from which the Maminiya Oya starts. The Maminiya Oya flows through paddy lands, forested areas and open country before it confluence with the Malwatu Oya. On the other hand, the Malwatu Oya that originates mainly on the western slopes of the SNR traverses a much longer and winding route through scrub, forested areas, paddy fields before it meets the Maminiya Oya.

Meanwhile, another water supply to Nachchaduwa is augmented by inflow from

the Kalawewa right bank canal in the Mahaweli System H scheme. The agreement how much the water is diverted to the scheme is made between the Irrigation Department and Ministry of Mahaweli Development according to needs.

The water source of the Periyakulama Tank, with a catchment area of 13.0 km² is a tributary of the Malwatu Oya, which originate from Maradankadawela. The river runs northwards along the A9 National Road, collecting rainfall and drainage water from paddy field, until it flows into the Periyakulama Tank. The river flows into the Nachchaduwa Tank directly through several minor tanks.

Mi Oya Basin

The 1,516 km² large and 110 km long, and fairly flat basin with isolated rocky outcrops, runs from the 240 m above sea level Dalukgala range down to the Puttalam lagoon at sea level. Unlike the adjacent Kala Oya and Deduru Oya basins, with upper catchment that include elevated and well-watered hills, and the former receiving considerable trans-basin inputs from the Mahaweli scheme, the Mi Oya basins with a annual runoff of 338 million m³ is confined almost entirely to the dry zone lowlands, and receives no trans-basin water inputs.

The Palukadawela Tank with a catchment area of 19.4 km² collects rainfall and drainage water from paddy field located in upstream minor irrigation schemes. The supply to Palukadawela is augmented by inflow from a feeder canal from the Ambakolawela traversing the Mi Oya through the Attaragala Tank.

Of the tributary rivers within the basin, the Nanneri Oya sub-basin, in which the Maha Nanneriya scheme and the Maha Nanneriya minor schemes are located, deserves mention in being the largest. A tank cascade, a connected series of minor tanks are organised with a micro-catchment of the Dry Zone landscape. The Maha Nanneriya minor schemes, a series of minor tanks, form the cascade in one of tributary of the Nanneri Oya. The river flows into the Maha Nanneriya Tank joining another tributary just upstream of the tank.

The hydrological features of each Tank is summarised below:

Hydrological Features of Tanks

Description	unit	Major Schemes		Medium Schemes			
		Nachchaduwa	Palukadawela	Periyakulama	Maha Nanneriya		
River Basin		Malwatu Oya	Mi Oya	Malwatu Oya	Mi Oya		
Catchment area	km ²	611.3	19.4	13.0	36.0		
Estimated annual runoff	1000m ³	107,756	3,283	2,530	5,874		
Description	unit	Minor Schemes					
		Kallanchiya	Attikulama	Mailewa	Ihalagama	Thambare	Ihala Nanneriya
River Basin		Mi Oya	Mi Oya	Mi Oya	Mi Oya	Mi Oya	Mi Oya
Catchment area	km ²	1.4	2.2	2.9	4.4	5.7	9.3
Estimated annual runoff	1000m ³	281	378	462	684	852	1,154

Chapter 3 POPULATION AND HOUSEHOLDS

The table below presents the demographic data of 5 irrigation schemes. Details are shown in Table M 3.1.

Demographic Feature of the Irrigation Schemes

	Nachcha- duwa Major Scheme	Palukada- wela Major Scheme	Periya- kulama Medium Scheme	Mahanan- neriya Medium Scheme	Mahanan- neriya Minor Schemes (Cascade)	Total
No. of villages (No.)	35	18	1	7	10	71
Population (No.)	21,860	7,220	1,000	2,200	2,810	35,090
Household (No.)	6,860	2,170	210	510	730	10,480
Family size	3.2	3.3	4.8	4.3	3.8	3.3
Farm Household (No.)	3,230	1,100	180	510	450	5,470
Ethnic Group						
- Sinhalese (%)	90.9	87.4	100	98.0	100	86.1
- Tamil (%)	-	1.0	-	-	-	0.1
- Muslim (%)	9.9	11.6	-	2.0	-	13.7
- Other (%)	-	-	-	-	-	0.1

Sources: Data obtained from farmers' organisations.

The total population and the number of farm households in all the schemes were estimated to be 35,090 and 10,480, respectively. The size of farm family averages 3.3 persons in the whole schemes. Most of villagers in the schemes are farmers or agriculture related occupation.

Chapter 4 AGRICULTURE

4.1 Soil and Present Land Use

Land use of selected irrigation schemes is described from the interviews of Grama Niradharis (GN) and from land use maps of the Land Use Planning Office.

(1) Soil in the schemes

Soil in the study area is based on Reddish Brown Earths (RBE) that are well to imperfectly drained and its texture is moderately fine- texture. This soil is widely spread in the upper parts of slopes. Lower part of the land has Low Humic Gley Soils (LHGS) which are poorly drained and moderately fine to fine texture. Other soil type in the study area is Non-Calcic Brown Soils (NCBS) which is well to imperfectly drained with medium texture and brownish to yellowish soil in the upper to middle slope of Reddish Brown Earths.

Typical type of soil formation of three soils is observed in Nachchaduwa major scheme from highland of high level canal to paddy land in low level canal. Some saline spots are recognised in the low-level canal area.

Periyakulama scheme is NCBS to LHGS in the irrigated area and higher elevated part of RBE. Palkadawela scheme has a three-soil combination from RBE and NCBS to LHGS with a moderate amount of gravel contained in some places and saline spots are observed at poorly drained lower parts. The Mahananneriya minor schemes are covered mostly by RBE to LHGS with some NCBS parts and moderate sand and gravel contents are observed. Saline parts are reported. The Mahananneriya medium scheme is mainly RBE and LHGS with moderate amounts of gravel and saline spots reported.

4.2 Land Holding and Land Tenure

Land holding and land tenure patterns are described based on the survey results of Grama Niladhari (GN).

Land tenure is registered at the Agrarian Services Centre (ASC) according to the Agrarian Services Act. In pre-survey interview in Periyakulama, registered tenants cultivate about 10% of paddy land and 90% is cultivated by owners, however, a field officer estimated that almost another 10% of land is cultivated by seasonal (non registered) tenants.

4.3 Agricultural Production

4.3.1 Paddy Cultivation

Total irrigable paddy land in the priority irrigation area is obtained in the Inventory Survey conducted by the Study Team. Paddy cultivation in the last five years from 1994/95 Maha to 1999 Yala is collected in Agrarian Service Centre (ASC) in the respective scheme. Paddy cultivation is fully depending on water condition, so water capacity of irrigation scheme and rainfall are affecting the planting and harvesting. Major and medium schemes are some how constant on cultivation area though the cultivated area is decreased in Yala. However in Mahananneriya medium scheme and the minor cascade of Mahananneriya are not able to cultivate almost none in Yala season in the last five years. (Table M4.1 to M4.4)

1) Cropping intensity

Nachchaduwa scheme is cultivated all paddy land in Maha season and more than half in Yala season. Maha cultivation is possible to cultivate full or nearly full in most scheme and most year. There is cultivation more than command area in the minor cascade, it might be occurred to be included the rainfed land of marginal land around the irrigation area. The medium and minor scheme of the Mi Oya is serious situation on paddy cultivation in Yala season that affected almost no harvesting even though planted but failed to harvest.

2) Yield

Generally larger irrigation schemes are stable and higher yield on paddy cultivation. Constant yield of over four ton is achieved in Maha season only in Nachchaduwa major scheme. In contrast, the minor cascade of Mi Oya and the medium scheme are around 3.5 ton or less. Water condition, fertiliser application and weed control are essential factor for high yielding.

Target yield on agricultural extension in the Mi Oya area is 5 to 6 ton/ha depending upon soil conditions, available water and appropriate fertiliser management. The participant farmers in the PCM workshop reported a yield of over seven ton per hecter in the extension scheme on the fertiliser use in Nachchaduwa major scheme. The target yield on the extension programme in Kala Oya area as Nachchaduwa and Periyakulama is 6 ton to 7 ton per hecter.

3) Production

One hector of the command area in the schemes has produced paddy estimating at 13 to 22 tons in the last ten cropping seasons for five years. It means that 1.3 ton to 2.2 ton has been produced from one hector of paddy land in each season due to the crop intensity.

4) Cultivation practices

Information on paddy cultivation practices each scheme was collected from responsible agriculture instructors (AIs) in the respective Agrarian Service Centres.

5) Fertiliser application

Regarding fertiliser application, high doses of chemical fertiliser and organic material were recommended in high yielding Programme and Yaya Programme which set target yields of 120 bushels per acre (6,000kg/ha) to 140 bushels per acre (7,000kg/ha) under favourable soil and water condition. Farmers have achieved the target yields when practising fully the recommended techniques, although organic material such as cow-dung and green manure are not popularly applied, but rice straw application or return to paddy field are practised in some schemes, such as in Nachchaduwa. (Table M 4.5)

Actual fertiliser application seems to be vary with farmers and areas. Availability of input material as fertiliser is not problem, since they are found in the shops nearby or in the commercial towns where located not so far away from studied irrigation schemes, although the price vary by place and route of distribution system.

6) Pest management

Integrated Pest Management is conducted in some schemes under the DOA programme in order to reduce pests and encourage effective use of agro-chemicals. A commonly observed problem in paddy cultivation is weed. It strongly affects yields and needs careful attention on chemical application and water control. Many kinds of weedicides are available in the commercial towns and technical guidelines are available in the Department through AIs. Private sector is also demonstrates their own products in the farmers' field. Farmers commonly use weedicides and insecticides, however the methods of use vary. Fungicide is not frequently used on paddy. A rice researcher pointed out regarding pest management, that most of the new

varieties are improved not only for yields but also for resistant to major insects and diseases. (Table M 4.6) Serious insect is Rice bug (*Leptocorisa oratorious*) which causes heavy yield reduction when it occurs.

Other serious ways of crop damage is by wild animals, especially by wild elephants, in the study schemes, as described in the Master Plan Study. It damages not only paddy but also other field crops. Although actual figures of these damages in agricultural production are not available, it not only reduces farmer's production but a more serious problem is to discourage their intention of cultivation agricultural commodity. Effective and easy countermeasures to prevent damage have not yet been found.

7) Labour costs

Labour costs in paddy cultivation in the 1998/99 Maha season and 1999 Yala season were reported and it has increased by 15% to 25% in some schemes. The difference between male worker and female worker wages exists and also in the kind of work performed. Female workers do transplanting and harvesting work and males undertake land preparation, chemical spraying and transportation responsibilities. The charges are Rs.125/day to Rs.150/day in Nachchaduwa and Rs.100/day to Rs.200/day in the other areas.

8) Other information on paddy

Milling charges of paddy slightly change by location and method. Lowest charge per one kilogram of paddy is Rs.0.80 for Nadu rice and Rs.0.85 by metal cylinder miller and Rs.1/= by rubber cylinder in Mi Oya area, and Rs.1/= for small quantity in Nachchaduwa area. The cost of milling in large scaled mills in Nachchaduwa area vary and is not clear. The cost of milling and polishing with transportation to Colombo and the other expenses makes it necessary to sell in Colombo at Rs.80 to Rs.200 per 65kg rice.

4.3.2 OFC Cultivation

Present OFC cultivation is mainly carried out under highland conditions. Some chillies and other pulses are cultivated in paddy lands. Available information of cultivated extents does not indicate whether it is cultivated on highlands or paddy land. Crop cultivation data obtained through AIs in the study schemes indicate that chilli cultivation is the most popular OFC. The table below shows popularly cultivated OFCs in order of priority from the scheme's presently available data for the last five years.

Priority	Periyakulama	Palkadawela	Mahananneriya	Ihalagama	Tambarewewa	Ihala-Nanneriya
1	Chillies	Chillies	Chillies	Chillies	Chillies	Chillies
2	Maize	Cowpea	Cowpea	Cowpea	Cowpea	Cowpea
3	Cowpea	Green gram	Green gram	Green gram	Green gram	Groundnut
4	Kurakkan	Groundnut	Okra	Groundnut	Groundnut	Sesame
5	Long bean	Maize	Black gram	Maize	Maize	Maize
6	Brinjar	Sesame	Groundnut	Sesame	Sesame	Brinjar
7	B'onion	Brinjar	Sesame	Brinjar	Brinjar	Okra
8	Black gram	Okra	Bushitao	Okra	Okra	Long bean
9	-	Long bean	Kekiri	Long bean	Kurakkan	Bushitao
10	-	Pumpkin	Pumpkin	Kurakkan	Long bean	Pumpkin

OFCs are normally cultivated in homesteads, highlands around the living premises and in chena land. Mixed cropping is a popular cultivation pattern, as maize with pulses, manioc with pulses or maize, vegetables such as cucumber, pumpkin, brinjal with maize or pulses, maize and groundnut under fruits trees, are seen in the field. Mixed cropping may have an advantage in risk evasion and total crop yields under highland conditions. An appropriate crop management for mixed cropping patterns and practices are recommended according to agro-ecological zones, by the DOA. Crop combinations are recommended by inter-row cropping, such as pulses in between maize, vegetables or pulses in between chillies and pumpkin in between maize. However, the farmers' practice random mixed cropping. On the other hand, sesame, chillies and soybean are mostly cultivated as single crops.

1) Yield

Yield of the priority irrigation scheme obtained from AI in respective ASC is shown in table below. The level of yield varied by crops and cultivated area though the yield in the table does not indicate either cultivated in highland or paddy land though most OFC in the study area is cultivated in highland condition. Potential to increase yield of respective crop is recognised during the field survey by the advanced farmers cultivating various OFC and managing very well. Technology for OFCs is available in DOA and agricultural extension service is capable to transfer the technology.

Unit Yield of OFCs in the Project Area

(Unit: ton/ha)

	Periya-kulama		Palkada-wela		Mahanan-neriya		Ihalagama		Tambare-wewa		Ihala-Nanneriya	
	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala
Chillies	1.0	1.3	1.3	1.4	1.2	1.8	1.9	2.1	2.0	2.1	2.0	2.1
Maize	1.2	-	0.6	0.9	2.0	2.5	1.0	1.0	1.0	1.0	1.0	-
Sesame	-	-	0.4	0.4	0.7	0.7	1.0	1.0	1.0	1.0	0.7	1.0
Cowpea	0.7	-	0.6	0.7	1.2	1.4	1.5	1.5	1.5	1.5	1.5	1.6
Green gram	-	-	0.4	0.4	1.1	1.5	1.0	1.0	1.0	1.0	-	-
Black gram	1.1	-	-	-	2.8	1.6	-	-	-	-	-	-
Groundnut	-	-	0.9	1.0	2.1	2.4	1.8	1.8	1.7	1.7	1.6	1.7
Okra	-	-	6.4	6.0	15.8	15.8	15.3	14.8	14.8	9.9	14.8	-
Brinjal	1.4	-	8.2	8.9	19.3	-	19.3	18.3	19.8	9.9	19.8	-
Long bean	2.0	-	6.0	6.2	-	-	14.6	14.8	14.8	-	12.4	-

2) Cultivated area of OFC

Available cultivation areas in individual schemes depend on the size of scheme and farmers' practices. As mentioned above, these cultivated areas of OFCs cannot be sorted out cultivated in highland or under paddy land conditions.

In Periyakulama medium scheme, in five years the total OFC cultivated area was 68 ha and the average annual OFC cultivated area is 13.6ha. Ratio to irrigation command area is only 7.5%. Almost 50% of OFC cultivation is in chillies. Chilli cultivation in Yala is carried out in paddy lands. The scheme is located about 20km from Anuradhapura town, provincial and district capital, and has easy access to fresh markets, although variety of crops is less and OFCs are cultivated only Maha season.

Palkadawela Major scheme cultivated OFCs by 140ha annually and 70% was in the Maha season. Major crops in the scheme are chillies, kurakkan (finger millet), long beans, maize and brinjal. The ratio to irrigated area by cropping season is only 7.3%. The scheme is located in the commercial town of Galgamuwa, and the town is on the main Colombo – Anuradhapura road. Access to markets is easy, however access from farming area to major road is difficult due to it being a large scheme.

Mahananneriya medium scheme is about 20km from Galgamuwa. Their commercial activities are in Galgamuwa, as a Pola and to supply needs. The scheme produces a wide variety of OFCs compared with others. Average annual OFC cultivation is 75.8ha and the ratio of OFC cultivation by season to irrigation area is 23.9%.

Ihalagama, Tambarawewa and Ihala-Nanneriya are in the cascade with six tanks and two more tanks, Kallanchiya and Attikulama, are located at upper stream. The cascade is located in between Galgamuwa town and the Mahananneriya medium scheme. Average annual OFC cultivation is 23ha, 25.4ha and 12.0ha in Ihalagama, Tambarawewa and Ihala-Nanneriya respectively. Average ratios to irrigation command area by season are 39.7%, 63.5% and 23.1% respectively. OFC cultivation in Maha season is 67%, 63% and 75% respectively. Kinds of crops in the three schemes are similar but Ihala-Nanneriya located lowest in the cascade has less cultivation in Yala season.

Field observations and interview surveys, Nachchaduwa have a wider variation in OFC cultivation. The scheme is located adjacent to Anuradhapura town and a favourable situation for market access, however on the other hand, farmers are depending upon paddy production more than others due to

a relatively reliable water supply. Large scale and well-maintained banana cultivation in paddy land using irrigation is observed in this scheme. Other advanced OFC cultivation is the large scale maize cultivation by new settlers without their own paddy lands, diverse crop cultivation of maize, chillies, vegetable and perennial crops with agro-wells and big onion cultivation in paddy land was reported during the field survey.

3) Crop protection

One of the reasons that farmers raise regarding the difficulties in OFC cultivation is damage by wild animals, especially wild elephants. Attikulama in cascade of Mi Oya abandoned, even paddy cultivation in marginal irrigation area along the scrub land. Elephant attacks were explained in all the study schemes during the field survey.

When OFCs are cultivated in the paddy lands, the field is located a distance from residing area and cultivators have to build watchman's huts on top of trees in or on the edge of the field. Farmers have to work in daytime and stay in the night watching for possible elephant attacks.

Farmers recognise that elephant does not eat sesame, however, any effective countermeasures to prevent damage to crops by elephant attacks have not been found.

4) Farmers' ideas about OFC cultivation

Farmers' experience and their ideas on OFC cultivation were checked during the PCM workshops. (Table M 4.7) Major scheme of Nachchaduwa was less interested about OFC in general. Farmers in Mahananneriya medium scheme are willing to do OFC cultivation, however, they have expressed that they have no experiences in cultivating many crops. Among crops which suggested, chillies and onions were commonly favoured, and vegetables were favoured by some. Women in many group showed their interest in vegetable with some exceptions.

Farmers' experience in OFC cultivation in paddy lands is still less and especially cultivation in Maha season is very exceptional. OFC in paddy land in Yala season has been practised by 10 to 30 % of participants.

Their interest for OFC cultivation is mostly for both income generation and for home consumption.

5) Marketing OFCs

All the schemes have marketing channel of farm products, such as Pola

(weekly market), Boutique (village sale store) or local traders at village level. It is OFCs and other perennial crops such as mangoes, coconuts and banana grown in the highlands and surpluses from home gardening that are commonly sold to the markets. However, farmers have to take their products to collecting points at a certain distance in order to sell for those channels. Merchants and middlemen visit the village to buy seasonal crops in season. Some farmers in Nachchaduwa send vegetables to the Dambulla market by lorry. In case of other individual farmers in the Palkadawela scheme cultivate vegetable year-round in irrigated paddy lands, with agro-wells, and merchant come regularly to take their products from the commercial town of Galgamuwa.

6) Other OFC related information

Grinding charges for chillies is Rs.20/kg in Maradankadawala near Periyakulama scheme and Rs.13/kg in Galgamuwa. Maize sold to a feed company in Anuradhapura district, grain moisture content required is 13%, which is lower than the requirement of 14% to 15% on maize exported.

4.3.3 Necessary Countermeasures on OFC Promotion

Farmers' choice of crop cultivation in the study area is paddy. On the other hand, paddy land is not used fully due to lack of water. The proposal is to promote OFCs cultivation for following reasons:

- An additional income from OFCs
- An effective land use
- An effective labour use
- An active farming
- An attraction to related economic activities
- An activate farming community

There are some difficulties for OFC cultivation at present and it is essential to overcome them for successful OFC production.

- Protection of commodity from wild animals
- Organisation to prevent from crop damages
- Organisation for maintain required volume of products for marketing
- Technical support for flexible crop cultivation to meet market demand
- Understanding farm management skills
- Cropping calendar of OFCs

Paddy cultivation starts from October to December in Maha season and from

March to May in Yala season in the Study area. Reliable heavy rainfall is expected in October and November, and April and May in the intermediate and dry zones. Severe dry spell is in July and August and moderate dry spell is in February and March. Maha paddy has to be harvested before April and before September in Yala.

Present OFC in highlands starts in September in Maha and from March to April in the Yala seasons. In both seasons the start depends upon rainfall.

Basically, the proposed cropping calendars for paddy and OFCs are as follows;

- (a) Maha cultivation for paddy to start in October and continued till the end of November by adjusting varieties.
- (b) Crop cultivation in paddy land is to be switched to OFCs in the first week of December in Maha cultivation. Then harvesting is to terminate before end of March by variety adjustment.
- (c) In Yala cultivation, paddy and OFCs are to start at the same time in March to April. If rainfall and water supply is sufficient in certain areas, fill up with paddy. The rest of area is to be planted by OFCs. Harvesting for both crops comes during the dry spell in July to August without overlapping labour use.
- (d) OFCs in highland is to start from September and harvesting after heavy rainfall.
- (e) For flexible cropping on OFCs, shortage of inputs especially seed supply is raised. Seed production has to be planned in previous cropping season within the organised area, as in the Mahaweli System 'H'.

4.4 Livestock Farming

The number of Livestock farms in the Study scheme is checked through Grama Niradharis (GN) and is being processed.

As a source of income generation, milk production is considered in the Master Plan study. The selected irrigation schemes for the Feasibility Study are not so active in milk production, however, in most of the schemes it is done by a small number of farmers and milk collecting points are available within or near the scheme.

In Nachchaduwa major scheme, four collecting points are set at Nachchaduwa by Nestles Company, and in Nelumbewa, Kaluwila and Hidogama by the Milk Producer Co-operative. There are two collecting points in Periyakulama scheme in Thirappane town and Maradankalawala town about four kilometres from the scheme. In Mi Oya scheme, there are six collecting points of Lanka Co., Nestles

and NLDB in Galugamuwa area where Palkadawela and some minor cascade schemes are close by and three points of Lanka Co. and private businesses in Mahananneriya covers Mahananneriya scheme and other minor cascade schemes.

Veterinary Surgeon's Centre is promoting milk production in every VS region with Artificial insemination (AI) for improvement of quality of cows. AI is charged Rs.22/= for three times (three months) and its success percentage is 50% to 90% depending on the centre. Seemon of Shindy, Sahiwal, Jersey, Friesian and Milking Zebu varieties are available for improving milking cows.

Price of milk depends on the fat content and range from Rs.9 to Rs.15/lit. for cows milk and Rs.18 to Rs.20/lit. for buffalo milk. Farmers in the study schemes are not positively improving the management. Problems sited are no proper feeding, no cattle shed, no proper medical care as vaccination and no pasture improvement. VSC recommends 1.5kg of rice bran costing Rs.5/day as supplemental feeding, and Guinea grass is recommended for improving pasture.

Number of milking farmers in the Study scheme recognised by the participants of PCM workshop are 107 families in Nachchaduwa, 26 families in Palkadawela, 10 families in Periyakulama, 9 families in Mahananneriya and 6 families in the minor cascade.

4.5 Inland Fisheries

The fishing population in the Study schemes recognised by the participants of PCM workshop is 188 men in Nachchaduwa, 5 to 6men in Periyakulama, 15 men in Mahananneriya, about 9 men in the minor cascade. Muslim community near Nachchaduwa reservoir has the Nachchaduwa Fresh Water Organisation with around 150 member, and other Farmers' Organisation are given 25 fishing boats for 34 fishing people from SANASA. Fishing is not practised in Palkadawela. Normally fish is sold at Rs.30 to Rs.40 per kilogram as wholesale price and retail price is Rs.40 to Rs.50 per kg. Major fish variety is Tilapia.

Monthly report of Nachchaduwa reservoir in June 1999 was 3.6 tons of fish and 110 fishing population with 48 fishing crafts according to the Statistics office in the Ministry of Fishery.

Chapter 5 IRRIGATION AND DRAINAGE

5.1 General

All of the model irrigation schemes selected in the Study are fed by impounding water in the tanks. The present condition of each scheme related to irrigation and drainage including water management and O&M is presented hereinafter.

General information on each scheme, such as history of scheme, and commanding area is given below.

General Information of Irrigation Schemes

Description	unit	Major Schemes		Medium Schemes	
		Nachchaduwa	Palukadawela	Periyakulama	Maha Nanneriya
Project history		- Built in 9 th century - Restored in 1906 - Rehabilitated in 1958 - Rehabilitated in 1989 by MIRP	- Built in 1958 - Rehabilitated by ADB assisted WRDP in 1997	- Tank rehabilitated in 1973	- Built in 1885 - Tank rehabilitated in 1939 - Rehabilitated by ADB assisted WRDP in 1995
Commanding area	ha	2,540	956	91	158

Description	unit	Minor Schemes					
		Kallanchiya	Arthikulama	Meilewa	Ihalagama	Thambare	Ihala Nanneriya
Project history		- Improved by Janasaviya fund in 1993	- Improved by DAS in 1982	- Improved by ADB assisted WRDP in 1998	- Improved by ID in 1989	- Improved by ID in 1956	- None
Commanding area	ha	8	12	22	29	20	26

The above table shows that most schemes have been rehabilitated or improved by the government with either external or internal resources. The present condition of irrigation facilities in the schemes are shown in Table M.5.1.

5.2 Water Source

Tank storage, being runoff collected in reservoirs, is an important resource for use especially in the dry season. Maximum storage is in November / December. With the supply of irrigation, water levels drop until March, and rise slightly with the April / May rains. From some tanks, small quantities of water are released for irrigation in the period April – July. Thereafter, tank storage drops sharply. Minor tanks may even dry up completely by September. People depending on such tanks for domestic water dig wells in the tank bed through the silt layer into the buried weathered mantle or to the buried old stream bed to tap groundwater.

The salient features of each tank are presented below.

Features of Tanks

Description	unit	Major Schemes		Medium Schemes	
		Nachchaduwa	Palukadawela	Periyakulama	Maha Nanneriya
Catchment area	km ²	611.3	19.4	13.0	36.0
Extent of tank reservation area :	ha	1,783.8	261.0	119.4	135.2
Effective storage capacity	1000m ³	55,688	7,709	1,674	2,504
Length of bund	m	1,649	1,178	1,220	1,097
Bund elevation*	m	104.70 msl	93.27 msl	104.88*	106.40*
Nos. of sluice		3	2	3	1
Nos. of spillway		1	1	3	1

Description	unit	Minor schemes					
		Kallanchiya	Arthikulama	Meilewa	Ihalagama	Thambare	Ihala Nanneriya
Catchment area	km ²	1.4	2.2	2.9	4.4	5.7	9.3
Extent of tank reservation area :	ha	6.1	12.1	13.3	20.6	17.6	13.3
Effective storage capacity	1000m ³	59	118	150	217	165	130
Length of bund	m	548	350	496	1,300	200	1,200
Bund elevation*	m	103.35*	103.34*	102.95*	103.95*	103.20*	103.65*
Nos. of sluice		1	2	3	1	1	1
Nos. of spillway		1	1	1	1	1	1

* : Bund top elevation is expressed, assuming that the elevation of low level sluice is 100 m.

Area – capacity curve of the tanks are given in Figures M.5.1 to M.5.3.

5.3 Present Irrigation and Drainage System

5.3.1 General Features of Distribution System

In general, the distribution system of each scheme is composed of the main canal, D-canals, F-canals with distribution facilities, such as, regulators and turnouts. D-canals branch off from the main canals while F-canals, in most cases, branch off from D-canals. The following table summarises the total length of the distribution system for each scheme.

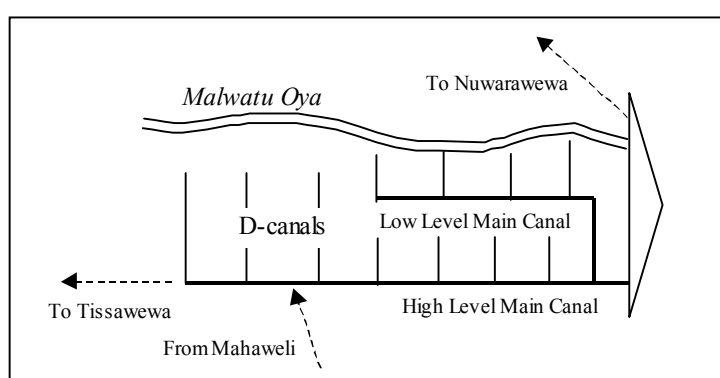
General Features of Irrigation Facilities

Description	unit	Major Schemes		Medium Schemes	
		Nachchaduwa	Palukadawela	Periyakulama	Maha Nanneriya
Main Canals	m	40,070	19,700	3,480	3,890
D-canals	m	20,800	18,200	-	-
F-canals	m	113,600	To be collected	-	-

Description	unit	Minor schemes					
		Kallanchiya	Arthikulama	Meilewa	Ihalagama	Thambare	Ihala Nanneriya
Main Canals	m	630	720	1,330	1,150	1,090	1,540
D-canals	m	-	-	-	-	-	-
F-canals	m	-	-	-	-	-	-

5.3.2 Nachchaduwa Irrigation Scheme

Nachchaduwa Tank releases water to downstream users through three sluices. The canal extending from the main sluice situated at the end of the left bank, bifurcates to the high level main canal and the low level main canal. The both proceed feeding paddy fields and small tanks on the way. The extents fed by the high level and low level main canals are 1,460 ha and 1,080 ha, respectively. The high level main canal confluence with the Jaya Ganga, the Kalawewa to Tissawewa. Drainage water from paddy field fed by the high level canal is collected by the small tanks and re-used for irrigation. While the main canals are

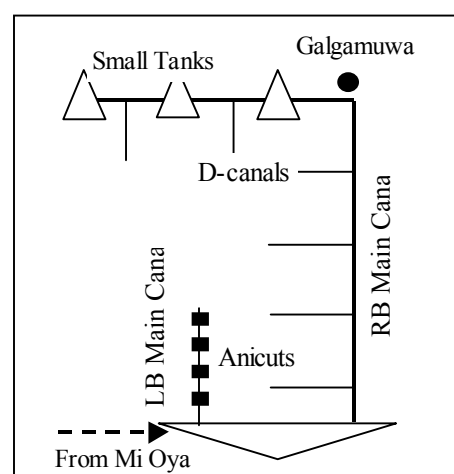


Nachchaduwa Scheme

unlined, retaining walls with brick masonry are provided in some portion of the D-canals and F-canals. A second sluice adjoining the spillway releases water to the Nuwara Wewa through the canal constructed by the early kings for the same purpose. The ancient Yoga Ela is now almost a natural stream flowing down to Nuwara Wewa. This sluice is situated some distance from the right bank on the northern end of the bund. The spill water flows through the Malwatu Oya to eventually join the Aravi Aru (the name of the terminal segment of Malwatu Oya). A third sluice constructed in 1970's, also releases water to the Nuwara Wewa along a higher contour. This sluice is situated near the northernmost end of the bund, and takes water along a new canal. List of canals and irrigation diagram of the Nachchaduwa scheme are shown in Table M.5.2, and Figures M.5.4 and 5.5, respectively.

5.3.3 Palukadawela Major Scheme

As for the Palukadawela scheme, water is delivered to the commanding area through two sluices. A RB feeds the commanding area for new settlers while a LB canal pro-

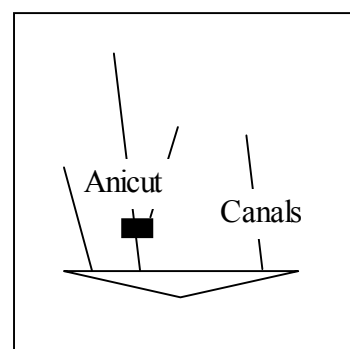


Palukadawela Scheme

vide water for commanding area in a traditional village (namely Purana Gama in Sinhala language). The 16km long RB canal runs north-wards along the contour line until it reaches Galgamuwa town, traversing paddy fields fed by the Maha Galgamuwa Tank. Then, the canal, crossing railway and the A28 national road, flows west-ward and flows into Paluwagama Wewa. It passes through several tanks, namely, Welihiddewa Wewa, and Rambottukulama Wewa. Such small tanks within the commanding area, as Aluththerathgama Wewa, and Mottapettewa Wewa, and Pahala Palukandewa Wewa, are out of the scheme. The RB main canal fed areas are divided into six Tracts. About 20 D-canals branch off from the main canal. The paddy field in the traditional village is fed by LB main cannal. Several temporary earthen dams (namely Amuna in Sinhala language) have been constructed by the farmers across the canal to divert the flow into their fields. List of canals and irrigation diagram of the Palukadawela scheme are shown in Table M.5.3, and Figure M.5.6, respectively.

5.3.4 Periyakulama Medium Scheme

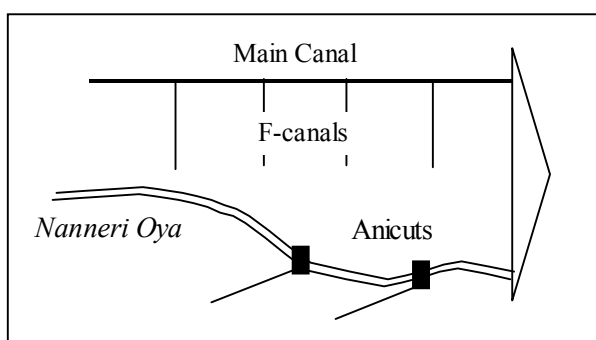
Three intakes are diverting water to the commanding area of the Periyakulama scheme. All the canals are of earth type without any turnout structures. The farmers take water by blocking or breaching the canals. Immediately downstream of the intake on the centre main canal, a concrete pick-up anicut is provided to divert water to the commanding area. An irrigation diagram of the Periyakulama scheme are shown in Figure M.5.7.



Periyakulama Scheme

5.3.5 Maha Nanneriya Medium Scheme

The distribution system of the Maha Nanneriya medium scheme consists of a RB Main canal of length 4.5 km with 16 Field canals directly feeding 37 ha of to total commanding area of 150 ha. Turnout structures are provided to divert water to the Field canals. The balance



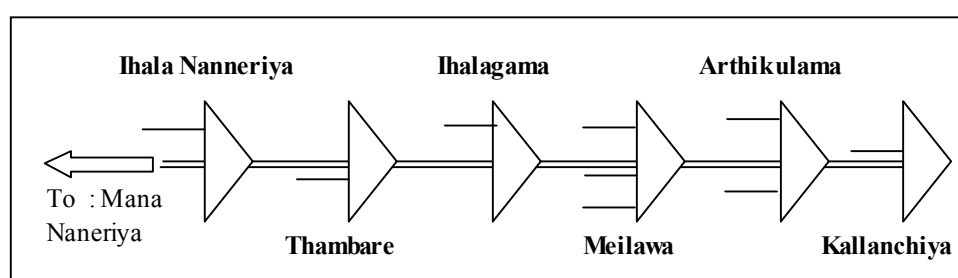
Maha Nanneriya Scheme

113 ha are fed thorough the spill tail canal, which collects the return flow and the

drainage water. Temporary earthen dams have been constructed by the farmers across the spill tail canal, for diversion of the flow into their fields. In addition, an anicut made of concrete was constructed across the spill tail canal. List of canals and irrigation diagram of the Palukadawela scheme are shown in Table M.5.4, and Figure M.5.8, respectively.

5.3.6 Maha Nanneriya Minor Schemes

The selected Maha Nanneriya minor schemes consisting of six minor tanks, Kallanchiya, Attikulama, Meilawa, Ihalagama, Thambare, and Ihala Nanneriya, form a linear cascade with direct succession, one below the other.



Maha Nanneriya Minor Schemes

The irrigation network below each tank in the cascade appears to have been adjusted over years for economising the use of tank water. The irrigation water that originates from a tank sluice runs usually along the side of paddy field. The drainage channel which appears toward the centre of the lower portion of the paddy field collects all the water that passes through the paddy fields and discharges into the next tank. In some schemes, small anicuts tap water from drainage channels. All canals in the schemes are earth lined, and except the Mailawa scheme, which was rehabilitated recently under the financial assistance of ADB, no structure on the canal is provided.

5.3.7 Drainage Condition

In all schemes, natural stream have been utilised for drainage channel. Through interviews to farmers, serious drainage and flooding problems were not identified in any schemes.

5.3.8 O&M Road

Except the Periyakulama and the minor schemes, roads are provided along main and distributary canals for operation and maintenance of irrigation facilities. The roads are also used to transport agricultural inputs and products. Special atten-

tion shall be paid for improvement of the roads because provision of the roads may reduce paddy fields.

5.4 Present Conditions of the Existing Irrigation Facilities

Present condition of the existing irrigation facilities revealed through field investigation by the Study Team is shown in the following table.

Present condition of irrigation facilities

Scheme	Tank	Irrigation
Nachchaduwa	- No serious problem is observed	- In some portion of canals, slopes inside the canal is scoured, embankment of the canals are broken. - In some portion of D-canals, retaining wall are deteriorated - Most measuring devices installed at the head of the D-canal are broken
Palukadawela	- No serious problem is observed	- Same as the Nachchaduwa scheme
Periyakulama	- Sluice gates are not functioned well	- No structures is provided in the canals
Maha Nanneriya	- No serious problem is observed	- Some structure on the main canal are damaged
Maha Nanneriya minor schemes	- Some of sluice gates are broken	- No structure is provided except the Meilawa scheme

The field investigation to identify condition of the facilities were carried out the ID staff as well as the farmers. The results of study include the locations for rehabilitation works, persons engaged, and estimated. It is remarked that rehabilitation / improvement plan of irrigation facilities for each scheme are to be formulated taking into consideration those results.

5.5 Water Management and Maintenance

Data and information of present condition of water management and O&M in each irrigation scheme were obtained throughout interview of farmers and ID staff. The results of survey are shown in Tables M.5.5 to 5.9.

5.5.1 O&M Responsibilities and their Hand-over

Under the participatory management policies of the government it is intended to turn over some of the system management responsibilities at and below the D-canal level to farmers in major and medium irrigation schemes. Minor irrigation schemes have been managed by farmers themselves, under technical guidance of the Provincial Engineering Department and DAS. The following table indicates the responsibility of O&M per each scheme category:

Responsibilities of O&M

Name of Scheme(s)	Operation			Maintenance		
	Tank Sluices	Turnouts on main canal	Turnouts on D-canal	Tank	Main canal	D & F – canals
Nachchaduwa	ID	ID	Farmers	ID	ID	Farmers
Palukadawela	ID	ID	Farmers	ID	ID	Farmers
Periyakulama	Farmers	-	-	ID	-	-
Maha Nanneriya	Farmers	Farmers	-	ID & farmers	Farmers	-
Maha Nanneriya Minor Schemes	Farmers	Farmers	-	Farmers	Farmers	-

Turnover can take place either formally or informally. Under formal turnover an agreement is signed between the agency and the relevant FO specifying the responsibilities to be fulfilled by the parties concerned. In the Nachchaduwa schemes, although the official turnover has been completed, it is observed that several constraints are still in existence.

- The farmers pointed out that the hand-over has been proceeded without mutual consent because the performance of rehabilitation works by the government are far from those they expected,
- Farmers other than the FO office bearers are not aware that the turnover of O&M have been completed. They did not understand what the system meant, and complaint to the government agencies have been boosted up,
- In some FOs, the agreement of the hand-over is not kept by the Office bearers, and
- Some documents necessary for operation and maintenance, such as an issue tree, inventory of facilities are not with FOs.

Informal turnover is a verbal agreement between the two parties. The FOs in the Palukadawela scheme operate and maintain below D-canal in an informal status. Both of medium schemes are also fully operated by FOs without official handed over. This is reason why the rehabilitation works for the schemes have not been commenced yet, and farmers are reluctant to take over the responsibilities of O&M under such condition.

Full turnover has not occurred in any of the schemes and the progress has stopped at a joint management stage. Payments continue to be made by agencies for O&M activities to FOs that have taken over responsibilities, either informally or formally.

5.5.2 Staff and Organisation

- Government organisation for major and medium schemes

Staff of Irrigation Department	
Designation	Responsibilities
Irrigation Engineer (IE)	O&M of overall system
Technical Assistant (TA)	O&M of main canal system
Work Supervisor (WS)	O&M of D-canal system
Maintenance Labour (ML)	

As for the ID, Deputy Director's Range Offices (DD's Office) are located in both Kurunegala and Anuradhapura. Each Range Office administrates several Irrigation Engineer's Offices (IE's office), where rehabilitation and O&M work as well as technical guidance to farmers are carried out. Technical staff of the IE's Office, headed by an Irrigation Engineer, consist of a Technical Assistant (TA), a Work Supervisor (WS), and a Maintenance Labour (ML). They proceed O&M of the major and medium irrigation schemes in co-operation with FOs

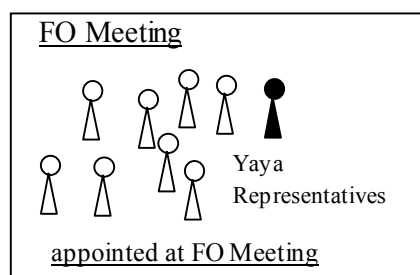
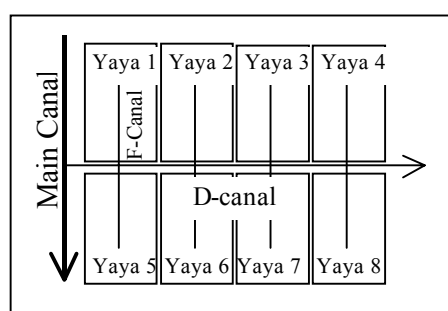
The schemes are being operated by two IE's offices. One is IE's office in Anuradhapura under Anuradhapura DD's office, and another is the IE's office in Galgamuwa under the Kurunegala DD's Office. The number of technical staff engaged in the scheme is summarised below.

Staff in Irrigation Department

DD's office	IE's office	Name of scheme	IE	TA	WS	ML
Anuradhapura	Anuradhapura	Nachchaduwa	1	2	2	6
		Periyakulama		1	1	1
Kurunegala	Galgamuwa	Palukadawela	1	1	1	0
		Maha Nanneriya		1	1	0

(2) O&M by Farmers Organisation

At present, there are two types of O&M by farmers. One is that members of a Farmers Organisation are appointed at a farmers meeting so as to carry out O&M. This type includes the major irrigation schemes, such as the Nachchaduwa scheme, and the Palukadawela scheme, and the Maha Nanneriya medium scheme.



Farmers are organised into legally recognised autonomous organisations. Normally, Farmers' Organisations covers areas fed by several D-canals, and they are made up of F-canal groups, each of which selects a Farmer Representative (Yaya Representative) to lead the group and to represent them to outsiders. The Farmer Representatives within a Farmers' Organisation form the Farmers' Organisation Committee that manages the Organisation. The President and other office bearers of the Farmers' Organisation

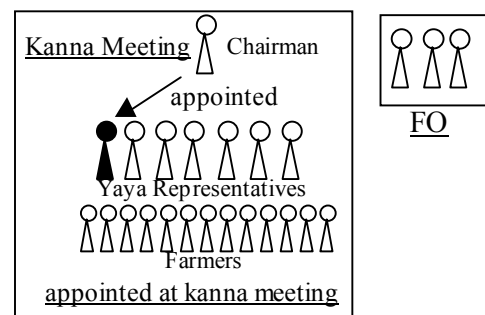
are selected from among the Farmer Representatives. The office bearers and the Yaya representatives are responsible for O&M within areas fed by the D-canals and a F-canal, respectively.

Major schemes, such as the Nachchaduwa scheme, and the Palukadawela scheme, have a Project Management Committee (PMC) federating the FOs. The PMC consists of representatives of the FOs and of the government agencies concerned with irrigated agriculture. These committees are generally chaired by a government official, but farmers make up a majority of the members. The PMC is responsible for preparing seasonal plans, including making water allocations to different parts of the schemes, and for solving irrigation and other problems. Some larger schemes have lower level joint management committees that focus on solving irrigation and agricultural problems.

(3) O&M by Farmers representative

Another is a traditional management system, which has been taken over from ancient time. Minor irrigation schemes as well as some of medium irrigation schemes, like the Periyakulama scheme, with rather small extents, are categorised in the system. In such schemes, water

distributors are selected at a “Kanna Meeting”, which is held before every cultivation season. A gate operator, named by a “Vel Vidane” is responsible for the O&M of the schemes. The Vel Vidane, appointed regardless of entry the FO, is hereditary in some schemes.



5.5.3 Planning and Scheduling

The “Kanna Meeting” (a seasonal cultivation meeting) is held before every seasonal cultivation, twice a year, to decide the cultivation schedule, such as extents and location fed by tank water, starting and ending dates of irrigation, operation method of a sluice gates on a tank, manner of rotational irrigation among distributary canals, method of maintenance works, penalty for persons who do not follow the decision, and so on.

With respect to major and medium irrigation schemes, prior to the kanna meeting, a pre-kanna meeting are held. The attendance of the meetings varies depending on the category of schemes as shown below.

Attendance of Kanna Meeting

	Major Schemes	Medium Schemes	Minor Schemes
FO Meeting Chairman	FO Leader	FO Leader	N.A.
Participants	FO members	FO members	
PMC Chairman	RPM of IMD	Chaired by TA of ID	N.A.
Participants	IE and TA of ID AI, DO, FO leaders	FO leaders, Farmer representatives	
Kanna Meeting Chairman	Divisional Secretary or District Secretary	Divisional Secretary	Divisional Officer of ASC
Participants	Grama Niladari, Bank, Insurance, IMD, ID, DOA, DAS, Land, Commissioner FR, Farmers	Grama Niladari ID, DOA, DAS, FR, Farmers	Grama Niladari Farmers

5.5.4 Water Distribution

The following tables outline the present condition of irrigation water distribution for each irrigation scheme.

Persons in charge of water distribution

Name of Scheme(s)	Tank Sluices	Turnout gates on main canals	Turnout gates on D-canals
Nachchaduwa	WS in ID	WS in ID	FO leader, FO secretary, FO Jalapalaka, or FC leader
Palukadawela	WS in ID	WS in ID	FO leader, FO secretary, or Yaya representative in traditional village
Periyakulama	Farmer named by Vel Vidane selected in the kanna meeting	-	-
Maha Nanneriya	FO secretary	Yaya representative	-
Maha Nanneriya Minor Schemes	Farmer named by Vel Vidane selected in the kanna meeting, or FO meeting	-	-

Water distribution method

Name of Scheme(s)	Tank Sluices	Among D-canals	Within D-canals (Among F-canals)
Nachchaduwa	- Continuous flow	- Rotation irrigation is adopted. - Duration of opening the gate depends on the extents fed by each F-canals	- Rotation irrigation is adopted. - Priority is given on downstream paddy field.
Palukadawela	- 6 days open, and 8 days closed	- Same as the tank sluice	- Rotation irrigation is adopted. - Duration of opening the gates depends on the extents fed by each F-canal. - Priority is given on downstream paddy field.
Periyakulama	- Schedule depending on rainfall condition	-	- No particular rotation rule is decided.
Maha Nanneriya	- 7 days open, and 7 days closed	- Rotation irrigation is adopted. (upstream 3 days, downstream 4 days, respectively)	- No particular rotation rule is decided.
Maha Nanneriya Minor Schemes	- Schedule depending on rainfall condition	-	- Rotation irrigation is adopted, depending on rainfall and the tank water volumes.

In the land preparation period, the first month of the cultivation, water is released continuously from the tank. The water issue programme, thereafter, is in accordance with the decision of the kanna meeting. The operators in both the irrigation department and farmers open and close the gates based on the programme.

As for major irrigation schemes, the tank sluices and turnouts gates on main canal system are operated by the irrigation department, while some distributary canals and almost all field canals are operated by members of FOs. Sluice gates are controlled by ID staff according to the operation schedule decided at the kanna meeting. In the Nachchaduwa scheme, water flows into the main canals continuously. The rotation rules among the D-canals are also decided at the meeting according to the extents fed by the canals and informed to the FO leaders in writing. The heads of distributary canals are operated in accordance with the rotational rules. The FO sets the rotation rules within a D-canal discussing it at a FO general meeting, but it depends on the scarcity of water. Usually, priority is given to areas located in downstream of the canal for fair water distribution. In general, it can be said that the more water source, the less regulation of water distribution.

In medium irrigation schemes, the tank sluice gates control is carried out by the farmers under technical guidance of the irrigation department officials in spite of the official hand-over to the farmers has not been made. The water distribution method within the command area is decided by the farmers.

The water distribution in minor irrigation systems is carried out by farmers themselves. In general, there is a flexible water distribution method in the minor schemes according to farmer's need.

The farmers take water of the F-canals through a farm turnout or by cutting the canal bund. Plot-to-plot irrigation is basically adopted within a farmer's field.

5.5.5 Monitoring of Irrigation Performance

In the major irrigation schemes, the daily records of water issue from the tank sluice with water levels of tank are collected by reading the water level gauges at the head of the main canals. The records are compiled weekly and sent to the head office of the irrigation department. A cultivation performance report is prepared in every cultivation season to evaluate the irrigation performance. In the reports, actual water consumption is indicated showing the cultivation extents and quantities of actual water issue.

On the other hand, as for the medium irrigation schemes, the flow data are col-

lected in fragment in the Maha Nanneriya scheme while no data is collected in the Periyakulama scheme due to lack of measuring devices at the head of the main canals. Further, no data has been collected in all the minor schemes.

It is also important to measure and monitor the flow at the head of D-canals to secure proper water distribution to each FO. However, the flow monitoring has not been conducted as the measuring devices at the head of the D-canal were damaged.

5.5.6 Maintenance

At present, maintenance activities for each scheme is carried out as follows:

Maintenance activities

Name of scheme(s)	Tank	Main Canals	D-canals	F-canals
Nachchaduwa	ID	ID	farmers by sramadana or contract	Farmers by panggu
Palukadawela	ID	ID	Farmers by sramadana or contract	Farmers by panggu
Periyakulama	ID	Farmers by panggu	-	-
Maha Nanneriya	ID & Farmers	Farmers by sramadana	-	Farmers by panggu
Maha Nanneriya Small Schemes	Farmers by sramadana	Farmers by panggu	-	

ID conducts the maintenance works for tanks and main canal in major and medium schemes, among which some works is entrusted to FOs on contract basis. For instance, in the Maha Nanneriya scheme, the maintenance of the tank sluice and spillway is carried by the farmers on contract basis.

There are two major maintenance activities carried by FOs: clearing and desilting. FOs are also expected to clear the weeds (jungle) from their own field canals by themselves. FOs are expected to de-silt their field canals by themselves. De-silting of distributary canals is done by FOs. Besides these major activities, FOs are also expected to attend to small repairs, including undertaking minor earth-works such as bund filling, and oiling and greasing of canal gates.

There are two kinds of maintenance works, namely, Sramadana and Panggu. Sramadana, a volunteer labour service, is a communal works which all farmers are expected to attend. In principal, sramadana is carried out in D-canal de-silting and clearing without compensation for the attendance, refreshment or allowance for them are sometimes covered by the FO's account or a contract. In some cases, the contracted maintenance work is carried out by sramadana basis to deposit all money to the FOs account.

Panggu is a maintenance system, that work is a length of canal to be maintained are allocated according to the extents farmers cultivates. The maintenance works of the F-canal is conducted by the panggu method. Usually, farmers attend the maintenance in the canals that are adjacent to their farm lands.

5.5.7 Conflict Resolution

The mechanism of conflict solution within and out of the community is outlined below.

Conflict Management

Name of Scheme(s)	In the case that water is not delivered depending on the schedule by the kanna meeting	Solution of conflict within lands fed by a canal
Nachchaduwa	- Channels for request is as follows : Farmers – Yaya representative – FO leader – FO committees – IMD - ID	- Discussion between the farmers is made at the presence of FO Leader
Palukadawela	- Channels for request is as follows : Farmers – Yaya representative – FO – IMD - The water management committee will take action to revise the irrigation schedule	- The FO Leader reports to the Water Management Committee to resolve the conflict
Periyakulama	- FO Leader, Vel Vidane, and farmers meet to adopt a rotational irrigation	- Settlement of the conflict may be difficult because to the problem are closely related the land tenure status
Maha Nanneriya	- As per request by the farmers, the FO Leader decides the revised water distribution method	- The Yaya representative attends to resolve the conflict - If the issues are not resolved, the FO Leader takes the action.
Maha Nanneriya Minor Schemes	- The meeting chaired by the Vel Vidane to take action - Failure of proper water distribution surely leads to total crop damages as the farmers usually plan and carry out irrigation, considering to save the tank water to the maximum extent	- Discussion between farmers are carried out - If the conflict is not resolved, the FO office bearers act as a mediator - Finally, problems will be reported to the Grama Niradhari if no solutions are expected even internal discussion

As shown in the above table, FO members complain to the government agencies as well as the FO office bearers if irrigation schedule decided at a kanna meeting not being implemented properly. It is also observed that farmers get to know the irrigation schedule hearing from the office bearers. This might cause misunderstanding for the irrigation schedule. It is remarked that the a water management committee is organised in the Palukadawela scheme. The committee consists of FO office bearers and the staff of ID to discuss irrigation problems.

The issues discussed in the farmers meetings include imbalance water distribution, stray cattle, illicit tapping, damage of irrigation facilities, and so on. Among them, the farmers recognise the most serious issue are that the water are not distributed equally within a channel. Everybody, who is concerned in the affair, discussed mutually at the presence of the yaya representatives as well as the FO office bearers, if needed.

In general, each FO holds mechanism to solve the conflict having several meet-

ings, and have a linkage complaining to the government agencies. However, it is quite a different matter, whether the conflict can be resolved through the discussion, and whether the decision made at the meetings will be surely implemented.

5.5.8 O&M Cost

Annual O&M budget for each scheme is shown in Tables M.5.10 to 5.11, and summarised as follows:

Annual O&M cost

Name of Scheme(s)	Government O&M cost (Rs.)	Cost allocated to FOs (Rs. /FO/year)	Salaris (per acre/season)
Nachchaduwa	960,000	- 5000 – 10,000	- 0.5 bushel
Palukadawela	300,000	- 5000 – 10,000	- 0.5 bushel
Periyakulama	42,000	- 17,000	- Not collected
Maha Nanneriya	57,000	- Not received	- Rs. 50 or 0.5 bushel
Maha Nanneriya Minor Schemes	No government O&M cost	- Not received	- Rs. 50 or 0.5 – 1.0 bushel

The O&M cost of ID includes the operation cost for the DD's office and the IE's office, and operation and maintenance cost for irrigation facilities. The operation cost includes office administration and allowance for the staff and excludes the staff salaries. Some 30% of total maintenance costs are allocated to the FOs for the maintenance of D-canals even though the responsibility of O&M have been handed over. The FOs spend the money on refreshment or allowances for their sramadana participants or make a deposit for future repair or maintenance works.

An allowance named by a "Salaris" is collected from farmers. They are spent for allowance of the gate operator and reserved for the maintenance activities. It is found that the collecting rate of the salaris is less than 50%, at present.

Some of the FOs, such as in Ihalagama, Thamare, and Ihala Nanneriya schemes, receive a Samurdhi funds. The funds are being used for maintenance work without collecting any O&M fee from the farmers.

5.5.9 O&M Equipment

No major O&M equipment other than tractors is operated by the office of the irrigation department.

Chapter 6 MARKETING AND PROCESSING FACILITIES

The table below shows the present situation of marketing and processing facilities in the schemes.

Marketing and Processing Facilities in the Schemes

	Nachchaduwa Major Scheme	Palukadawela Major Scheme	Periyakulam Medium Scheme	Mahananeriya Medium Scheme	Mahananeriya Minor Schemes	Total
Rice mill - Big	17	-	-	1	-	18
- Small	43	19	3	9	6	80
Chilli mill	22	3	2	1	2	30
Coconut oil mill	1	1	-	-	-	2
Storage house - Fertiliser	6	1	-	1	1	9
- Rice	2	3	-	-	1	6
Pola (Yes/No)	Yes	Yes	No	Yes	Yes	
Mill collecting point	2	1	-	-	-	3

Sources: Interview survey for FOs and animators

Rice consumed in the schemes are milled within these areas. Marketable surplus of rice are handled by unhulled rice and milled by large-scaled millers at outside area. With exception of Nachchaduwa scheme, each village has several small rice mills, and a substantial milling capacity for paddy processing presently exists in these schemes. Each village has also one or two grinding machines for chillies.

With exception of the Paddy Marketing Board in the Palukadawela scheme, the villages in the schemes have almost no storage facilities. Most of products have been stocked in the farmers' houses and sold them to dealers, individually. In Nachchaduwa and Palukadawela schemes, the co-operatives and FOs have 6 small storage houses for fertilisers.

The most important market for locally grown fruits and vegetables is the periodic market fairs called 'pola'. Pola is a place where farmers, traders and consumers gather to sell or buy merchandise and is held on one or two scheduled days of the week. In the scheme, there is only one small pola ("Sati Pola") at Athuruwella in Nachchaduwa scheme.

The daily milk collection at Milco and Nestles collecting points is picked up by taken operating on scheduled routes and transported to the chilling centre at Anuradhapura. In Nachchaduwa and Palukadawela schemes, there are only three collecting points, and other schemes have no point.

Chapter 7 RURAL INFRASTRUCTURE

7.1 Rural Infrastructure in the Schemes

The present conditions of rural infrastructure in the Schemes are summarised as follows:

Rural Infrastructure in the Schemes

Sub-Sector	Mahananneriya Minor Schemes (Cascade)								
	Nachchaduwa	Periyakulawa	Palukadawela	Mahananneriya	Kallanchiya	Arthikulama	Malewa	Ihalagama/Tharbane	Gama
(1) Domestic Water Supply & Sanitation									
- Adequate potable water	75.0 %	66.0 %	38.7 %	29.0 %	20.0 %	24.8 %	8.5 %	24.0 %	27.9 %
- Piped born water supply	nil	nil	nil	nil	nil	nil	nil	nil	nil
- Protected wells	45.0 %	40.0 %	27.4 %	28.2 %	5.3 %	5.0 %	8.5 %	24.0 %	27.9 %
- Tube wells	59 nos	3 nos	55 nos	3 nos	nil	1nos	nil	nil	nil
- Sealed latrines	47.2 %	38.0 %	23.7 %	26.7 %		16.5 %	17.7 %	20.0 %	8.5 %
- Permanent latrines	67.8 %	52.0 %	54.9 %	36.4 %	49.0 %	24.8 %	23.0 %	40.0 %	47.3 %
(2) Electrification									
- Houses having electricity	59.1 %	95.0 %	15.1 %	5.5 %	0 %	14.5 %	0 %	60.0 %	34.5 %
(3) Roads									
- A class roads in Kms	8.1km	0.5 km	nil	nil	nil	nil	nil	3.2km	2km
- B class roads	13km	nil	nil	nil	nil	nil	nil	nil	nil
- C class roads	192.2km	nil	nil	nil	nil	nil	nil	nil	nil
- D class roads	48km	3 km	131.4km	9.9km	nil	4km	10km	3.2km	28km
- Rural roads	51.5km	2 km	51.6km	9km	10 km	2km	5km	1.6km	16km
(4) Health Care									
- Hospital	2	nil	nil	1	nil	nil	nil	nil	nil
- Clinics & or Dispensary	2	1	1	nil	nil	nil	nil	nil	nil
(5) Education									
- Primary Schools	9	1	7	1	1	nil	nil	nil	nil
- Secondary Schools	8	1	2	nil	nil	nil	nil	nil	nil
- Literacy Rates	95 %	98 %	80 %	82 %	80 %	60 %	90 %	80 %	80 %
(6) Community Centres									
- Samurdhi Centres	2	nil	nil	1	1			1	
- Gramodaya Mandala	nil	1	1	nil	nil	nil	nil	nil	nil
- Praja Mandala	4	1	9	1	nil	nil	1	1	1
- Others									

Source: Divisional Secretariats, Grama Niladali, Irrigation offices.

As for development stages of rural infrastructure in the Schemes, some disparity would exist between Schemes in Nachchaduwa cluster and those in Mi Oya one.

The latter shows a tendency to lag behind to some extent on such basic needs as drinking water and electrification. These seem to be due to differentials on both topographical and groundwater resources conditions: the latter group is located on rather far from town area and their drinking water depends largely on the wells which dry up sharply during the dry months (June, July and August).

7.2 Problematic Aspects relevant to Rural Infrastructure in the Schemes

Problematic issues taken up by the farmers at the various workshops and identified by the field investigations are summarised as follows:

Problematic Aspects relevant to Rural Infrastructure in the Schemes

Aspects Schemes		Main Problematic Aspects		
		Key Issues	Remarks	
Nachchaduwa	Health care	In the Scheme, there exists only one hospital which has 3 wards for maternity, female and male but no treatment for serious illness and operation. The villagers have to get such treatment at general hospital in A'pura which is always crowded, so the hospital is required to improve.		
	Drinking water	During the dry months, water quality in wells deteriorates annually, so villagers have to improve it by extracting Ca, Mg sediment through boiling it.		
Periyakulawa	Drinking Water	During the dry months, almost 80% villagers can't get water from nearby wells but 0.5km apart from.		
	Sanitation	Popularity of permanent latrines is still kept on 50%, the others are temporal in forests. More spread is expected, but its cost of 15,000Rs causes not to be built. Program for them would be expected.		
Palukadawela	Health care	Shortage of health facilities; hospital, wells, and latrines.		
	Education, roads	Poor condition of roads connecting village to town so public transportation services are inadequate.		
	Electrification	Electrification remains low level of 15%. Prompt improvement is expected.		
Mahananneriya	Drinking Water	Almost all villagers get drinking water from wells nearby their homesteads, but during dry months (June, July, August) these wells dry up annually, consequently they are forced to dig bottom of dried. tanks at distance of 1 km.		
	Health care	Tanks to collect water and convey it to their houses at an average distance of 1 km.		
	Education, roads	1 hospital exists but a doctor is apt to leave, so villagers cannot get proper treatment. Roads are the same above.		
	Electrification	Electrification is quite low remaining only 5.5%.		
Mahananneriya Minor Schemes (Cascade)	Kallan-chiya	Drinking Water	Situation is almost the same as that of Mahananneriya.	
		Health care	There is no hospital in the area, it is difficult to get adequate treatment, shortage of latrines.	
		Electrification	None of electrification	
	Arthi-kulama	Drinking Water	the same as that of Mahananneriya	
		Health care	There is no hospital in the area, it is difficult to get adequate treatment, shortage of latrines.	
		Electrification	Electrification remains low level of 14.5%. Prompt improvement is expected.	
	Mallewa	Drinking Water	the same above	
		Health care	There is no hospital in the area, it is difficult to get adequate treatment, shortage of latrines.	
		Electrification	None of electrification	
	Ihalagama	Drinking Water	the same above	
		Health care	There is no hospital in the area, it is difficult to get adequate treatment, shortage of latrines.	
		Electrification	Electrification is kept on rather high level of 60% within the cluster.	
	Tharbane	Drinking Water	the same above	
		Health care	the same above	
		Electrification	the same above	
	Gama	Drinking Water	the same above	
		Health care	the same above	
		Electrification	Electrification is 34.5%.	

Source: Workshops, Divisional Secretariat, Grama Niladali

Chapter 8 MARKETING OF FARM INPUTS AND OUTPUTS

8.1 General

Like in the rest of the country, the farmer in the project area is adjusting to a new and competitive marketing environment; a result of government policies of decreasing the role of the public sector agencies; the gradual withdrawal of input subsidies and the liberalisation of imports. The consequence of these policies is that domestic farm produce competes with imports and the farmer in the project area receives an open market price for his produce and pays a market price for agricultural inputs (except urea).

8.2 Marketing of Agricultural Products

The majority of holdings in the project area are under 2 ha and production of paddy averages less than 6 tons per harvest. After retention for seed and home consumption, the marketable surplus is very small. Paddy in the project area is sold either to assemblers, collectors or directly to millers. Assemblers and collectors send their produce to wholesale markets. Storable field crops in the project area are bought by collectors and resident traders while some produce is sold in roadside stalls or taken to the polas. The farmer in the project area has the choice of selling his produce to the village or local shopkeeper, at the rural pola to traders usually with lorries, sell at collection points along the road or at few local assembly markets. Little produce is held back at harvest and all market surplus is disposed of by the farmer immediately after harvest so as to enable him to repay loans and prepare for the next crop. In addition, farmers in the project area have no on-farm storage facilities and some of the farm produce is perishables that cannot be stored.

Farmers in the project area are well served with a network of roads that connect with major towns with access by bus. The problems that most farmers face are in bringing their produce from the farm to the nearest motorable road. The farmers in Nachchaduwa, Palukadawela and Periyakulama have collectors operating in the area. Farmers in Nachchaduwa have easy access to the Athuruwela pola while farmers in Palukadawela and Mahananneriya have easy access to the Galgamuwa pola that operates twice weekly and is within easy bus access. Both latter schemes are only 8 –12 km from Galgamuwa. In addition, there are many collectors and mills that also collect produce in the project area. It is also a practice among some farmers to send their produce (especially vegetables) by lorry to Dambulla. In the case of Palukadawela, farmers who cultivate year

round irrigated vegetables have arrangements with traders to take their products on a regular basis to Galgamuwa for disposal.

The polas in the study area are important locations for disposal of produce. However, they do not offer adequate basic facilities such as drinking water, water for washing produce, toilet facilities and parking space and loading and unloading facilities for lorries. The Galgamuwa pola has traders operating in the open or on the roadside of a major road while the Athuruwela pola is on water logged land. These two polas attract 600 and 100 traders respectively although there are only 140 and 20 stalls.

Milk production is not so important in the project area, but milk-collecting points operate. There are four collection centres in the Nachchaduwa scheme, two in Periyakulama, six collection centres in Palukadawela and three in Mahananneriya. There is also one milk chilling plant. All these collection centres are operated by private companies.

Overall, once farmers have brought their produce to a motorable road, they have several options to dispose of their produce. However, with an open market regime, with no producer support prices, and lack of proper grading and standardisation, farmers face more price uncertainty.

8.3 Marketing of Farm Inputs

The private sector companies are playing an increasingly bigger role in the supply of inputs to the farmers in the project area. It is only in the area of seeds that the public sector still continues to play a relatively important role. Paddy seeds required by farmers for the next crop are mainly retained by farmers in the project area. Some farmers buy paddy seed from the Agrarian Service Centre and Co-operatives. Other seeds are obtained from the village or town store or from agents of seed companies. Fertilisers are marketed in the project area through distributors as well as the Agrarian Service Centres. In addition, due to a loan scheme introduced in 1998 fertilisers in the project area are also group purchased by farmer organisations. Four farmer organisations in the Nachchaduwa Scheme undertake group purchase of fertiliser requirements of its members. However, most farmers obtain their fertiliser needs from private traders, dealers and agents of fertiliser importers in the town or villages in the project area. Cattle manure is also available and traded in the project area. Along with fertiliser, distributors and local agents also market agro-chemicals. Traders in the town or village in the project area usually stock seeds, fertiliser and agro-chemicals in their store and act as agents for several suppliers

8.4 Agricultural Prices

Farmers are also open to seasonal price fluctuations. Monthly average prices for farm produce reflect this seasonality with prices being lowest at the Maha harvest with a gradual increase till the next harvest. Prices also fluctuate spatially depending on the production and consumption area and the cost of transport. Prices also react to good and bad harvest- a response to supply and demand.

Chapter 9 COMMUNITY AND FARMERS' ORGANISATION

9.1 Village Community

The total population in the project area, which includes the Nachchaduwa and Palukadawela major schemes, the Periyakulama and Mahananneriya and the Mahananneriya minor scheme (a cascade of five minor tanks) has a total population of a little over 35,000 people. There are about 10,000 households within the project area. The average family size is 3.3 persons. Primarily the population is Sinhala and Buddhist with a very small percentage, about 13% Muslims, whose religion is Islam. Almost all the Muslims are concentrated in parts of Nachchaduwa and Palukadawela. Economically, the population falls into the lower-middle and low income categories. Educationally, 40% had completed primary level. 35% had passed the GCE (Ordinary Level) and only 20 % had passed the GCE (Advanced Level) examinations. Occupation-wise almost all are farmers with only an insignificant percentage involved in other vocations, working mostly as traders or small businessmen. Economic backwardness and social instability are common problems facing the communities. These are the result of unproductive agriculture, unemployment, addiction to alcohol and the decline of social and moral values, among a host of other problems.

9.2 Farmers' Organisations

There are altogether 28 Farmers' Organisations in the project area, 14 in Nachchaduwa, 07 in Palukadawela, 06 in Mahananneriya and 01 in Periyakulama. The total membership in all Organisations amount to 4,024 members. One of the Organisation's in Palukadawela had been formed in 1970, 18 were formed in the 1980's and 09 in the 1990's. All Farmers' Organisation had been registered only in the 1990's. The membership fee varies from Rs.5/= to Rs.100/=, but there area number of organisations that do not charge a membership fee. The entrance fee also vary from Rs. 25/= to Rs. 100/= with some not charging an entrance fee at all. The participation at Farmers' Organisations' meetings range from 30% to 80%. In about one third of the organisations the participation is less than 50%. Although the primary objectives of the organisations are water management, operation and maintenance of the irrigation system at the lower levels and helping to increase agricultural production, they usually handle many more functions. It must also be noted that many of the Farmers' Organisations do not operate efficiently, due to limited capabilities of officers, non participation of members and also the absence of advice and guidance.

9.3 Other Community Based Organisations

There are a number of community based organisations, other than the Farmers' Organisations. Among them the most important and active are the Death Donation Societies. Almost every family in the community is a member and provides funeral services on the death of family members of the members of the Society. The services rendered generally include a monetary contribution to buy a coffin, provision of tent, chairs, soft drinks, meals, during the funeral period, and decorations. These societies are the most active and participation is very high. The Women's Societies are also fairly active, but only in certain areas. One the main tasks is to provide income generation opportunities to their members and also acts as a forum where women's problems are discussed and possible solutions found or suggested. The Youth Clubs are in operation in some of the communities, but the number that is active is very few. They usually organise youth activities, training programmes to improve their professional skills and also sports activities. In recent times however, most of the Clubs are dormant due to the lack of official support. Lay religious societies are also in operation both among the Buddhists and the Muslims, and they are usually connected to the various religious centres. There are a number of other organisations in certain communities, such as the Rural Development Societies, which are not very active, unlike in the past.

9.4 Gender Issues

Women in the study area account for about 50% of the population. Most women actively participate in the farming activities, both in paddy and other field crop cultivation. However, they do not involve themselves in strenuous activities, but in such activities as weeding, transplanting and the preparation and supply of food. They also support them in the Chena activities of their husbands, wherever it is practised. In addition they do home-gardening, livestock farming and poultry keeping. Women also work as a group with various non-governmental agencies in income generating activities. In these many ways they support the income generation activities of the families, many having specific plans for the future. In addition, they fulfil the arduous domestic tasks of cleaning and maintaining the house, taking care of children, planning and the preparation of meals and fetching of water and fuel for domestic use. On the negative side, it has to be noted that the women felt that do not get enough support from the men in their farming activities and that they are not given an opportunity to actively participate in Farmers' Organisation activities. In fact there are only about five farmer leaders. In fact, in recent times there is an increasing trend in the incidence of violence against women, which is to a large extent due to the increasing use of alcohol almost in all project areas. The participation of women in participatory planning workshops gives them an opportunity to air their views and opinions in public and help prepare plans for the development of their communities.

Chapter 10 AGRICULTURAL AND SOCIAL SUPPORT SERVICES

10.1 Project Related Institutions

The introduction of the devolution policy in 1987 promoted the involvement of the Provincial Councils (PCs) in development and the agricultural and rural development activities have currently been implemented both by the central governmental line agencies and the institutions under the PCs in Sri Lanka. Among such institutions, the major institutions related with the present Project include: 1) Department of Irrigation Development (DOID) and Irrigation Management Division (IMD) of the Ministry of Irrigation and Power (MOIP), 2) Department of Agriculture (DOA), Inter-Provincial Extension Unit (IPEU), Anuradhapura and Agricultural Development Authority (ADA) of the Ministry of Agriculture and Lands (MOAL), 3) Provincial Department of Agriculture (PDOA), 4) Agrarian Services Department (DAS) of the MOAL, 5) Provincial Department of Animal Production & Health (PDAP&H), 6) National Aquaculture Development Authority (NAQDA), 7) Coconut Cultivation Board (CCB), 8) rural credit institutions and 9) institutions for income generation activities as shown in the following table.

Major Project Related Institutions

Major Functions	Institutions
Irrigation Development & Management	DOI
Irrigation Management	IMD
Crop Sub-sector Development & Extension	DOA, IPEU, PDOA, NCP & NWP
Livestock Sub-sector Development & Extension	PDAP&H, NCP & NWP
Inland Fisheries Sub-sector Development & Extension	NAQDA
Coconut Sub-sector Development & Extension	Coconut Cultivation Board
Farmer Supporting & Management of Minor Scheme	DAS, Anuradhapura & Kurunegala
Agricultural Research & Development	Research institutions (DOA) & others
Seed Production & Distribution	DOA, PDOA & private sector
Rural Credit Services	State/private banks, co-operatives etc.
Income Generation Support	NYSC, NAITA, SEDD, DS

NYSC: National Youth Service Council; NAITA: National Apprentice & Industrial Training Authority

SEDD: Small Enterprises Development Division, Ministry of Youth Affairs, Sports & Rural Dev.

10.2 Agricultural Extension

A number of institutions under different jurisdictions engage in agricultural support activities in the Project areas and the major institutions include: 1) Inter-provincial Extension Unit (IPEU), Anuradhapura, of the DOA, 2) Department of Agrarian Services, 3) Provincial Department of Agriculture (PDOA) of NCP and NWP, 4) Provincial Department of Animal Production & Health (PDAP&H) of NCP and NWP, 5) National Aquaculture Development Authority (NAQDA), 6)

Coconut Cultivation Board (CCB) and 7) Agricultural Development Authority (ADA). Among such institutions, the IPEU and PDOAs have the most important role in extension activities and provide a range of extension services in the areas. Features and major functions of the institutions involved in agricultural extension/support activities are discussed below.

10.2.1 Food and Horticulture Crops Sub-sector

(1) Institutions Involved in Extension Activities

The primary institutions responsible for the extension activities for food and horticulture crops sub-sector in the Project areas are the IPEU, Anuradhapura and the PDOA, NCP and NWP as follows;

Inter-Provincial Extension Unit (IPEU)

The extension functions of the DOA are largely devolved to the Provincial Departments of Agriculture while the undeveloped central and policy functions and services remain with the DOA. The division of DOA responsible for the undeveloped agricultural extension functions is the Extension & Training Division. The undeveloped functions of the Division include development of extension technology and system, communications, education & training and extension services in major irrigation schemes.

For providing extension services for irrigation command areas of major schemes extending over plural provinces, the six (6) Inter-Province Extension Units are established in the country. The extension services in the Nachchaduwa Major Scheme is covered by the Unit placed in Anuradhapura, which cover some 31,000 ha of irrigation command areas of 5 major schemes in NCP and NWP. The Unit has 2 segments, each staffed with 15 Agricultural Instructors (AIs) stationed at AS Centres, and the field extension services are provided through the AIs. The organisational structure of the Unit is shown in Figure M 10.1. The deployment of AIs in the Nachchaduwa Major Scheme, their service areas and experiences are shown in Table M 10.1.

The current extension targets of the IPEU for paddy fields are: 1) increase of average paddy yield from current 3.5 t/ha to 5.0 t/ha, 2) crop diversification, 3) extension of post harvest technology and 4) reduction of cost of production through IPM and use of organic fertilisers. The same for highland areas are: 1) year round cultivation in agro-well command areas, 2) nutritional improvement and 3) homestead development. Major constraints for the execution of the mandate of the Unit are as follows;

- Extension and technical skills of field staffs are unsatisfactory; only 1 AI out of 4 AIs assigned for the Nachchaduwa Scheme is permanent staff and others are contract staff,
- Lack of new appropriate technologies to attract interest of farmers,
- Research and extension linkage is still weak,
- Poorly staffed compared to the target areas of extension services, and
- Shortage of vehicles to carry out effective and extensive field guidance and supervision and to take integrated approach of field officers at field level.

Department of Agrarian Services (DAS)

The agricultural supporting services of DAS including farm inputs supply, establishing & strengthening FOs, establishing & supporting Agrarian Service Committee, promotion of paddy seed production and cultivation loans through Farmer Bank (pilot operation) are provided through the AS Centres established at divisional level. Its farmer support services at village levels are provided by the FA or ADPA posted at GN division. The deployment of FAs/ADPAS in the Project areas, their service areas and experiences are shown in Table M 10.2.

Provincial Department of Agriculture (PDOA)

The PDOAs of the ministries for agriculture in NCP and NWP are the institutions responsible for the area specific extension services for food and horticultural crops sub-sectors in the provinces, except for the extension services in the command areas of major irrigation schemes covered by the IPEU. The head of the department is Provincial Director of Agriculture. The organisational set-up of the Departments consists of the three tiers of provincial, district and divisional levels as shown in Figure M 10.1. At District Offices, Deputy Directors of Agriculture are posted as the head. At divisional level, the segment and/or divisional ADAs are placed at AS Centres or Divisional Secretariats. The divisional ADA provides guidance to and supervises AIs in his division. At village level, AIs, field extension agents, are stationed at the AS Centres under the divisional or segment ADAs. The deployment of the AIs in the Project areas, their service areas and experiences are shown in Table M 10.1.

The extension targets of the PDOA, NCP for paddy are: 1) improvement of paddy productivity from the current yield level of 3.8 to 4.5 t/ha, 2) crop diversification (maha:paddy & yala:paddy/OFC/vegetables), 3) introduction of IPM, 4) use of organic fertilisers and 5) yield increase of maize & soybeans, expansion of cultivated areas of mung beans & big onion and

disease control of chilli. The same for highland areas are: 1) expansion of fruit cultivation, 2) introduction of vinyl house culture and 3) extension of flower cultivation, mushroom culture & bee keeping.

The current extension targets of the PDOA, NWP basically follow the central government targets and for paddy fields are: 1) improvement of paddy productivity through the introduction of quality seed, organic fertilisers and IPM from the current yield level of 4.3 t/ha to 4.6 t/ha in 80 % of major/medium irrigation areas and up to 6.0 t/ha in 20 % of the same by year 2005; 2) improvement of paddy productivity in minor irrigation schemes from the current yield level of 3.5 t/ha to 3.8 t/ha by year 2005, 3) crop diversification (OFC), especially in minor schemes. The same for highland areas are expansion and yield increase of fruit and OFC.

Major constraints for the execution of the mandate of the PDOAs are similar to those of the IPEU.

(2) Present Extension System

After the closing of the SAEP, the integrated approach for the agricultural extension of the participatory institutions has been terminated. However, the IPEU and PDOAs have continued to apply similar approach to the extension system introduced under the project as follows;

Present Extension System in the Project Areas

Field Extension Agents	- AIs stationed at AS Centres supervised by senior officers at segment or divisional offices (AO or Divisional ADA).
Target Groups	- Small farmer groups of 10 to 25 farmers (basically), FOs & individual farmers.
Field Extension Method	- Training/guidance through implementation of field programs, - Periodical visits to program sites & groups (once/ 1-2 weeks), - Assistance provided by Farmer Animator (not always), - Visits to non-beneficiary areas are limited.
Farmer Training (Class)	- Representatives of small farmer groups & FOs organised at division, district & province level, - Guidance/training through training components accommodated in field programs.
Extension Coverage	- Targeted to be about 20 % of the whole farmer groups within the service area and 2 FGs/day; - However, in case of some AIs in NWP, 8 times/month, monthly coverage is limited to 10 to 15 FGs at most because of more frequency of official meetings. - Capacity in coverage of field programs/AI: about 6 programs
Supervision/Monitoring	- By senior officers at segment or divisional offices, - Supervision/monitoring by district/province staff is limited.
Guidance/Training:	- Periodical meeting at divisional office & district offices (once per 1 to 2 weeks & monthly, respectively), - Pre-seasonal in-service training, - Ad-hoc training on special subjects on needs basis.

The current extension frame work and research-extension linkage is illustrated in Figure M 10.2 and the extension management system including the formulation process of the seasonal extension programs and the in-service training system of field officers (AIs) under the IPEU and PDOAs are shown in Table M 10.3.

(3) Deployment of Extension Staffs in the Project Areas

The deployment of field level extension staffs including AIs and FA/ADPAs in and around the Project areas and their experiences and service areas are presented in Table M 10.1 and M 10.2 and summarised below.

No. of Extension Staffs Deployed in and around the Project Areas

Staff	Nachcha.	Palukada.	Periya.	Mahanan.	Cas. VII
AI (No.)	4	3	1	1	3
Service Area/AI (ha)	1,480	2,670	3,490	3,270	-
FA/ADPA	13	7	1	1	3

Note: Service Area/AI – Farmland area in AS division/No. of AIs at the AS Centre

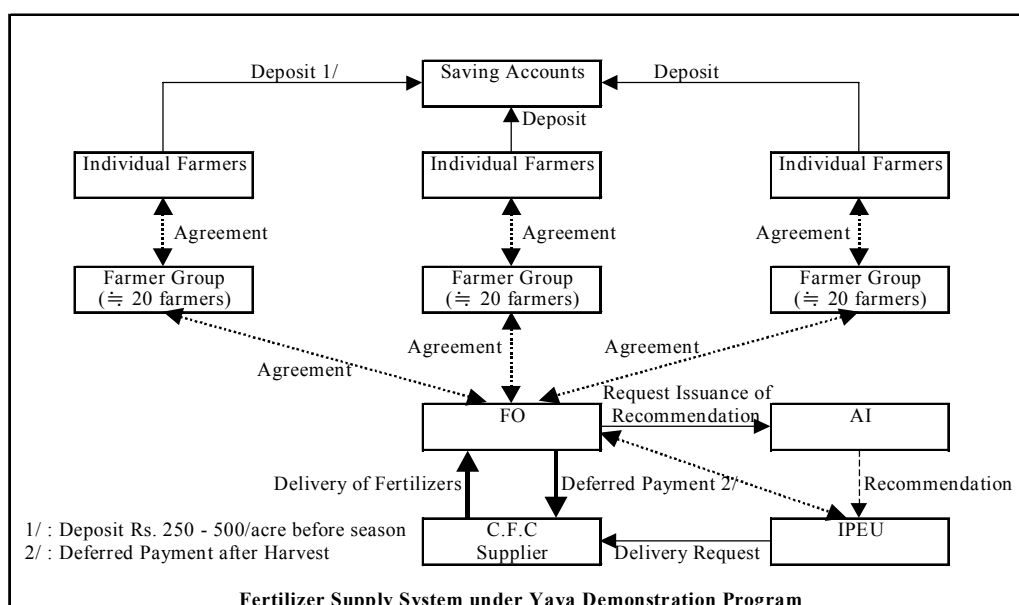
The service farmland areas of the AIs vary from some 1,500 ha at the AS Centre Nachchaduwa to 3,500 ha at the AS Centre Tirappane. The extension target areas of the IPEU, the AS division Nachchaduwa, has more intensive extension coverage compared with the AS divisions under the PDOAs. The extension coverage per AI in the AS divisions under the PDOAs is similar to that of the national average of about 3,000 ha. However, in any cases, the deployment of extension staffs of PDOA/IPEU is limited to meet the requirements of individual farmers.

One FA/ADPA is posted to every GN division in principle and the intensity of the their deployment appears to be enough to meet farmers requirement. However, compared to large volume of duties assigned to him, covering activities on farmer support, extension, data collection and collection of acreage tax, their technical and extension skills are rather poor since their technical background are mostly obtained through the induction training of 3 months at PDOA or ASC and the recipients of technical in-service training are limited as shown in Table M 10.2.

(4) Current Extension Programs in the Project Areas

The agricultural extension programs in the Project areas are implemented under the central and provincial budgets or the support of the donor funded projects in the rural development and irrigation development sectors. The extension programs in the cropping seasons of 1999 (1999 yala and 1999/2000 maha) implemented or scheduled in the project schemes are presented in Table M 10.4.

The significant features of the programs in the Project areas are the implementation of large-scale (yaya) paddy demonstration program with fertiliser supply/credit under deferred payment system. The program is implemented by all the extension agencies of IPEU, and the PDOAs, NCP and NWP. However, in the Nachchaduwa Major Scheme the program has been implemented extensively by the IPEU for the past 3 seasons and highly promising results of average paddy yields of 5.6/ha (in 100 crop cuttings) were reported in the 1999 yala season program. The fertiliser supply/credit system employed in the program of IPEU is as follows;



The extension services directed to highland and homestead are rather limited because the primary target areas of the extension agencies are irrigated paddy fields. The main support program toward highland/homestead in the Project areas is a fruit seedling distribution program. The conspicuous features known from the current extension programs by the extension agencies are that the extension programs in the schemes covered by the PDOAs are quite limited compared with the scheme covered by the IPEU.

10.2.2 Livestock Sub-sector

The PDAPHs in NCP and NWP are the institutions responsible for providing veterinary and extension services for livestock sector in the Project areas. The head of the department is Provincial Director of Livestock (PDL). At district level, District Offices of PDAPH are established in Anuradhapura and Polonnaruwa of NCP and Kurunegala and Puttalam of NWP. At divisional level, there are 19 Veterinary Surgeon Divisions (VSDs) and VS Offices in

Anuradhapura District and 16 VSDs and VS Offices in Kurunegala District. At each VS Office, one Veterinary Surgeon (VS) is posted and provides veterinary services in his division. The project related VSD are Nuwaragam Palata East, Tirappane and Galgamuwa and VS Offices are deployed in Anuradhapura, Tirappane and Galgamuwa as shown in Table M 10.5. The VSs are supported by the Livestock Instructors (LDIs) stationed at the VS Offices. LDIs are field level extension agents of the PDAPHs. Major constraints for the execution of the mandate activities of the PDAPHs are as follows;

- Activities in livestock husbandry sector are still restricted although some approaches toward the improvement of livestock husbandry have been taken by PDAPHs,
- Skills in livestock husbandry of most LDIs are limited because the veterinary services and artificial inseminations were the main stay of their extension services in the past,
- Poorly staffed compared to the target areas of extension services, and Poor logistic support for providing both on-station and mobile services.

The main extension target groups of the PDAPHs are small and large-scale livestock farmers. Among the divisional level livestock officers, the LDIs supervised by VSs have contact with farmers at village level. The LDIs are to report at AS Centres every Wednesday and are supposed to collaborate with other field extension agents in order to take integrated approaches to farmers problems or needs, although such occasions appear to be limited. On the other days, they are fielded and engage in their own duties mentioned above at village level. At villages, they have the collecting points at GN offices or elsewhere which are established to collect farmers demand for their services. The deployment of livestock field staffs, VS and LDI, is at VSD basis and the number of the staffs posted in the project-related divisions is limited compared with their service areas as shown in Table M 10.5 and below.

No. of Livestock Field Staffs Deployed in and around the Project Areas

VS Division	Project Schemes in Service Area	Staff Deployment
Nuwaragam Palata East	Nachchaduwa	VS 1; LDI 1
Tirappane	Periyakulama	VS 1; LDI 3
Galgamuwa	Palukadawela, Mahananneriya, Cascade VII	VS 1; LDI 5

The extension programs other than animal health services of vaccination and treatment and breeding services of AI implemented in the Project Schemes are shown in Table M 10.5. Although the coverage of the current extension programs is rather limited, the programs include animal distribution, cattle shed construction support, farmer training and poultry supply.

10.2.3 Inland Fisheries Sub-sector

The development and extension of inland fisheries in the Project related areas are mainly promoted by the newly established institution for the objectives, the NAQDA. The development and extension services of the Authority at district/divisional level are provided by the Aquaculture Extension Centres (AEC) and the Nachchaduwa and Periyakulama Schemes are located within the service areas of the AEC Anuradhapura and the Palukadawela and Mahananneriya Schemes and Cascade VII are in the service areas of the Nikaweratiya AEC service area. The AEC at Anuradhapura was established in 1997 and are staffed with seven technical staffs as shown in Table M 10.6. However, the AEC in Nikaweratiya is yet to be established and currently only one field officer, Fisheries Inspector (FI) is posted at the Nikaweratiya DS office. The major activities of the AECs include distribution of fingerlings to tanks, supply of fishing net and fishing gears, promotion of development of fish ponds, farmer training and organisation of farmers (Table M 10.6). The extension activities of the AEC Anuradhapura appear to be established to a certain extent and it is implementing support programs of IFAD and ADB projects.

10.2.4 Other Institutions Involved in Agricultural Extension Services

Other major government institutions involved in agricultural extension services in the Project areas include: 1) Coconut Cultivation Board (CCB), 2) Agricultural Development Authority (ADA) and 3) private sectors. The extension activities of the institutions in the Project areas are rather limited and their extension services are provided through field activities of divisional level field officers. The deployment of field staffs of the CCB and ADA in the Project related areas is shown in Table M 10.6.

The extension services of the CCB are delivered through the CDO stationed at a divisional office, in case of the project schemes of Palkadawela, Mahananneriya and Cascade VII by the divisional office at Galgamuwa and the schemes of Nachchaduwa and Periyakulama by the office at Anuradhapura. The main activities of the CDOs are the distribution of coconut seedlings under the subsidy scheme as shown in Table M 10.6. The project related areas are situated in the service areas of the two divisional ADA offices, at the Galgamuwa and Tirappane AS Centres. The main activity of the divisional level field officer of the ADA, Agricultural Research and Productivity Officer (ARPO), is the promotion of agro-well development under the subsidy base (Table M.10.6)

The involvement of private companies in agricultural extension services is

basically restricted to the fields of milk production and services by chemical suppliers. In milk production, several processing firms provide support services such as AI, farmer training, animal feed supply and organisation of producers in exchange of milk purchasing in the Project areas. The support activities of chemical suppliers are limited to an advisory role, generally provided in exchange of purchase of their products and field demonstration of their products.

10.2.5 Project Related Agricultural Supporting Facilities

The project related main agricultural supporting facilities identified through the master plan study (Phase I Study) include the In-service Training Institute (ISTI) Maha Illuppallama, PDOA, NCP, Provincial Seed Farms, PDOA, NWP and the Integrated Farmer Training Centre (IFTC), PDAP&H, NWP as follows;

In-service Training Institute (ISTI)

The ISTI established in 1982 at Maha Illuppallama, NCP is only a training institution under the PDOAs in NCP and NWP. The centre is staffed with 1 ADA and 3 SMS, 1 training officer (AI), 1 farm manager (AI) and 1 Agricultural Officer (AO) and has 2 vacancy posts of SMS. It has a dormitory to accommodate 60 participants. In 1998, the Centre conducted 87 training courses for staff and farmers and the total number of trainees was 2,561. The Centre was renovated with the provision of SAEP. However, the provision of audio-visual and printing equipment is needed for the efficient implementation of training and preparation of training materials.

Provincial Seed Farms, NWP

Two Provincial Seed Farms at Wariyapola and Galgamuwa are operated by the PDOA, NWP. The Farm at Galgamuwa has 80 acres of land and is for multiplication of fruit planting materials and OFC seeds, mainly for government program needs. It is poorly established and its target production of some 55,000 planting materials in 1999 was not met.

IFTC, NWP

The Integrated Farmer Training Centre (IFTC) established in 1994 at Nikaweratiya, NWP is the only training institution under PDAPHs in NCP and NWP. The centre is staffed with Farm Manager, 1 Training Officer and 1 assistant. It has a classroom to accommodate 50 participants and demonstration farm of 40 ha, where buffalo, goat, milking cow and poultry husbandry and

integrated farming system are demonstrated. Training activities in 1998 covered some 2,900 trainees. The Centre is poorly equipped without dormitory and transportation facilities.

10.2.6 Agricultural Extension Activities for Women Farmers

The project related agricultural extension agencies, the PDOAs and IPEU, have a section or staffs assigned for extension services directed to women farmers. The PDOA, NCP and NWP have a section of Farm Women Extension Unit. The IPEU has an AI assigned to extension services for women farmers. The main extension activity of such sections or staff is the farm women extension program having components of home garden establishment, kitchen improvement and family nutritional improvement.

10.3 Agrarian Service Centre and Agrarian Service Committee

10.3.1 Agrarian Service Centre (AS Centre)

The farmer supporting services of DAS including farm inputs supply, establishing & strengthening FOs, establishing & supporting Agrarian Service Committee (AS Committee), promotion of paddy seed production and cultivation loans through Farmer Bank (pilot operation) are provided through the Agrarian Service Centre (AS Centre) established at divisional level. The AS Centre is to be established as a nucleus place for providing support services to FOs and individual farmers. The Project areas are covered by two district offices of DAS, namely, Anuradhapura and Kurunegala and are located within the service areas of four AS Centres as shown below.

Project Related AS Centre

AS Centre	Project Schemes in Service Area	Proportion 2/
Nachchaduwa	Nachchaduwa Major Scheme	40 %
Tirappane	Periyakulama Medium Scheme	1 %
Galgamuwa	Palukadawela, Kallanchiya, Attikulama Schemes	8 %
Mahananneriya	Mahananneriya Medium Scheme, 4 Minor Schemes 1/	4 %

1/: Include Palu-mailawewa, Ihalagama, Tambarewewa & Ihala-nanneriya Schemes

2/: Proportion of scheme command area to the total farmland in the AS Centre service area

The Divisional Officer (DO) of DAS is the head of AS Centre and managerial role of the Centre in practical meaning is taken by the DO. He also serves as Secretary to the AS Committee. The AS Centre is established with offices for the DO, AS Committee and for field officers of various institutions involved in agricultural development and support. It is to be administered by the Committee

which composed of the representatives of 10 FOs and 5 agricultural officers. The Centre has a dual function, firstly as retail outlets of farm inputs. Secondly, the Centre is to be established as local headquarters for all divisional level staff engaged in agricultural development and support works. The results of the inventory on the services areas, offices, facilities/machinery and deployment of field officers of the four project related Centres are presented in Table M 10.7. The findings on problems for operation and management of AS Centres obtained through interviews with DOs are also shown in the Table. The common operational problems of the Centres are poorly established office facilities, lack of communication means and transportation means for the integrated activities of the related field officers.

10.3.2 Agrarian Service Committee (AS Committee)

The AS Committee is the committee established as the organisation executing support services provided through the AS Centre and it is to prepare estimates of required inputs in advance to cultivation seasons and procure them for timely distribution to FOs and farmers in the service area of AS Centre. However, the business activities of the project related AS Committees are rather poor and the current financial status of them are marginal suffering from the substantial cumulative losses as shown in Table M 10.7. Another main function of the committee is to assist the divisional level agricultural staff in the preparation of annual Agricultural Development Program through the Divisional Agricultural Committee. The common operational problems of the Committee include shortage of funds and less interest of FO/farmers (Table M 10.7).

10.4 Agricultural Research

Agricultural research in Sri Lanka is carried out by a number of central government institutions. The Ministry of Agriculture and Lands (MOAL) is responsible for research on all crops other than coconut, rubber, tea and cashew. In the MOAL, Department of Agriculture (DOA) and Department of Export Agriculture (DEA) respectively has the responsibility for research and development on food and horticultural crops and on export agricultural crops.

Research activities on food crops, horticulture crops and farm mechanisation are under the jurisdiction of Department of Agriculture (DOA) and are carried out by the three Divisions of DOA, the Rice Research and Development Division (RRD), Field Crops Research and Development Division (FCRD) and Horticultural Crop Research and Development Division (HORD). The research activities under DOA are principally commodity based and are established agro-ecological region-

wisely. The institutions of DOA include three Research and Development Institutes having central research function of each division and six Regional Agricultural Research and Development Centres (RARDC). In addition, 20 sub-stations (Agricultural Research Stations, Agricultural Research Units and Adaptive Research Units) are implementing more field oriented research activities under the main institutions. The institutions which are expected to be the technical resources for the present Project are shown in Table M 10.8.

Liaison between the regional research organisations and the Provincial Department of Agriculture (PDOA) is effected through the Provincial Technical Working Group (PTWG) organised on provincial basis, which was formally called Regional Technical Working Group (RTWG). The PTWG meets 1.5 to 2 months prior to the commencement of cropping season. The Group is to discuss research results, extension progress and problems in the previous season, extension programs in the coming season, research and training needs and to plan future research programs. The PTWG is chaired by the director of PDOA. The Makandura RARDC is the member research institute for the NCP PTWG that covers both the service areas of the PDOA and IPEU. The FCRDI, Maha Illuppallama is the same for the NWP PTWG. All research Officers, ISTI staff, DOA senior officers and officers of PDOA and IPEU are nominated as members of the PTWG.

Another linkage activity between research and extension is the formation of a diagnostic team on need basis. The team composed of researchers and provincial and central extension staffs makes visits to problem areas during cropping season in order to obtain information on problems and constraints in the adoption of new technology and find solutions, if possible. These two measures were introduced aiming at adoption of more field and farmer oriented activities by research groups under the Agricultural Extension and Adaptive Research Project (AEARP) and have been established and maintained as tools to build linkages between research and extension in the Project Area.

10.5 Seed Production and Distribution

10.5.1 Seed Production and Certification

In the seed production and distribution system in the country, the research institutions has been responsible for developing new seed and plant varieties and the Seed and Planting Material Development Office (SPMDO) of the SCPPC has the responsibility for multiplication, processing and distribution of them. The production of seeds in Sri Lanka has been privatised since 1992 and is performed by both the public and private sectors. The paddy and OFC seed production by

the public sectors is carried out by the seed farms of the DOA, the Mahaweli Authority and the PCs and by the private seed growers such as private firms, co-operatives, Farmers Organisations (FOs) and individual farmers contracted with the government farms. The participation of FOs in paddy seed production is one of promotion areas of DAS. Currently, 17 Government Seed Farms are operated by the SPMDO. In the Project related areas, there are two Government Seed Farms, one in Maha Illupallama, Anuradhapura district and the other is in Nikaweratiya, Kurunegala district, and one provincial seed farm of the PDOA, NWP is operated at Galgamuwa. In addition, the new seed-processing unit was established at the RRDI, Batalegoda, Kurunegala district. Paddy seed production is also encouraged through extension programs of DOA/PDOA. Such programs implemented in 1999 in the Project schemes include paddy seed production program and self-seed production programs as shown in Table M 10.4. The areas covered by such programs in the schemes are summarised below.

Paddy Seed Production Programs Implemented by Extension Agencies in 1999

Schemes	Programs & Areas Covered		Institute
Nachchaduwa	Seed Production Program/Self-Seed Prod. Program	17.4 ha	IPEU
Palukadawela	Seed Production Program	10.3 ha	PDOA/NWP
Periyakulama	Seed Production Program/Self-Seed Prod. Program	4.2 ha	PDOA/NCP
Mahananneriya	Self-Seed Prod. Program	0.2 ha	PDOA/NWP
Cascade VII	New Variety Introduction program	0.1 ha	PDOA/NWP

The main private seed producers in and around the Project areas include the CIC Seeds (Private) Ltd, the Ellawak Horticulture (Pvt.) Co. at Galkiriyagama and the Eppawara Multipurpose Co-operatives. The CIC Seeds is an affiliated company of the CIC Fertiliser (Pvt.) Limited and a large-scale private producer operated in the two-privatised government seed farms under lease agreement. The firm has its own seed certification system and processing unit in Maho. The current seed production capacity and farm areas under operation by the firm are as follows;

Seed Production of CIC Seeds

Location of CIC Seed Farms	Paddy Field	Upland Field	Seed Production Capacity
Talawa, Anuradhapura	20 ha	8 ha	Paddy 4,000 t/year 1/ OFC chilli/maize/soybeans etc.
Hingurakgoda, Polonnaruwa	280 ha	400 ha 2/	

1/: About 65% produced by contract growers; 2/: Including potential areas for expansion

Since the introduction of the NSP, the seed production shares of the public sector have gradually decreased. The paddy seed produced in 1997 by the public sector was some 5,600t or 53 % of the total production in the country. The paddy seed production by the private sector in the year accounted for 47 % or about 5,000t as shown in the following table.

Production of Seeds by Sector, 1997

	Paddy		OFC	Vegetables
	Volume (t)	Share (%)	Volume (t)	Volume (t)
Public Sector *1	5,622	53	171	28.4
Private Sector	5,000	47	n.a	n.a
Total	10,622	100	-	-

*1 Include seed production by contract grower

Source: Administration Report 1997, DOA

According to the SCPPC, the total production volume in 1997 only suffice 7 to 8 % of the national potential requirements for paddy seed. The production of OFC seed and vegetable seed by the public sector in the year was only 171t and 28.4 t, respectively. The SCPPC estimates that the seed production share of the public sector is about 95 % for OFC and 50 % for vegetable seeds. In case of OFC, the public sector still dominates seed production. The private sector has less interest in OFC seed production because of low returns from most of OFC seed production compared to those from vegetable seed production and fluctuating demand for the seed. The requirements for vegetable seeds, especially exotic vegetables, and seed potato are mostly met by import.

The production of planting materials of horticulture crops by the public sector is a mandate of HORD and the number of planting materials issued in 1997 was some 330,000. Similarly, the same of the minor export crops is undertaken by DEA and it issued 7 million materials (including citronella) from its nurseries in 1998.

Another important function of the SCPPC is the seed certification services for maintaining seed quality, which are rendered throughout the country by its 15 Seed Certification Stations. In the Project related areas, there exist the Stations in Maha Illupallama and Nikaweratiya. The seed certification system of it covers the seed production of both the public and private sectors. The services consist of field inspection in seed producing fields and laboratory test. In case of paddy, the field inspection is carried out for three times during a growing period, at the time of vegetative growth stage, at maturing stage and at harvesting time. Similarly, three field inspections are made for OFC and vegetable seed production. After harvest, sample seeds are sent to the Stations for laboratory test. The seed products of fields passed both the field inspection and laboratory test are issued as certified seeds after processing by the Government Seed Farm.

10.5.2 Seed Distribution

The prevailing seed distribution systems of paddy, OFC and vegetables in the country are shown in Figure M 10.3. The paddy seeds produced by the public sector are usually distributed through the AS Centres or directly to farmers. OFC seeds of this public sector are delivered to the Government Seed Farms and

usually distributed to the ASCs or directly to the end users. In case of vegetables, seeds are processed at the Centres at Kundasale and Gannoruwa and delivered and packaged at the Seed Store at Gannoruwa. Then vegetables seeds are usually distributed to farmers through private dealers. The distribution channel of seeds produced by the private sector are varied, but commonly distributed to end users through the private dealers. Imported seeds or planting materials such as seed potato are generally distributed through private dealers.

10.6 Rural Credit and Agricultural Insurance

(1) Credit Institutions

The rural credit facilities in and around the Project areas are operated by the three categories of institutions, the formal institutions, semi-formal institutions and informal institutions as explained in Table M 10.9. The bank branches rendering services in and around the areas are presented by scheme in Table M 10.10.

(2) On-going Credit Schemes in and around the Project Areas

The GOSL's rural credit sector policy of establishing a widespread rural banking network at the grass root level as a measure to make rural credit more accessible to the rural people has been pursued by the Central Bank of Sri Lanka (CBSL) and a substantial number of credit facilities are presently operated in the rural areas. Major institutional credit facilities for rural based economic activities being operated in and around the Project Areas are presented in Table M 10.11 and 10.12.

(3) Foreign Funded Rural Credit Schemes

The CBSL has a function as the executing agency for credit schemes accommodated in foreign funded development projects. In such schemes, the Bank is responsible mainly for admitting PCIs, issuing Operating Instructions to PCIs, disbursing refinance to PCIs in respect of loans under the projects and monitoring and co-ordinating of loan schemes. The foreign funded credit scheme and the on-going projects in and around the Project areas which accommodate a credit component in their scopes include: 1) Second Perennial Crops Development Project (ADB), 2) North Central Province Rural Development Project (ADB), 3) North Central Province Participatory Rural Development Project (IFAD, SIDA & WFP) and 4) the Japan U-Ko (friendship) Micro Finance Project. The list and some details of such projects are presented in Table M 10.13.

(4) Sources of Funds for Farming

With an aim of collecting very general information on the sources of funds for

paddy cultivation in the Project areas, the inquiry survey was made with the entire project related AIs. The results of the survey indicate that the most important sources of farming funds appear to be the non-formal institutions such as village rice millers/traders, farm inputs supplier and merchant followed by own funds.

(5) Agricultural Insurance

The agricultural insurance is issued by the Agriculture and Agrarian Insurance Board (AIB) of the MOAL. The AIB has its district offices in Kurunegala and Maho in Kurunegala District and Anuradhapura and Tambuttegama in Anuradhapura District. The Nachchaduwa and Periyakulama Schemes are in the service area of the Anuradhapura Office and Palukadawela Scheme, Mahananneriya Scheme and Cascade VII are covered by the Maho District Office. The AIB operates two types of agricultural insurance, crop insurance and animal insurance. Target crops of the crop insurance are paddy and OFC and the animal insurance covers cattle and goat. However, only the Maho District Office does provide insurance service for OFC, presently. Further, both in the Anuradhapura and Maho District Offices, the beneficiaries of crop insurance for paddy are limited in number. The conditions of crop insurance for irrigated paddy are as follows;

Conditions of Crop Insurance for Irrigated Paddy

Target Schemes	Target Areas	Amount Insured	Premium 1/
Major/Medium Scheme	Irrigation command areas	Rs. 6,000/acre	Rs. 300/acre
		Rs. 4,400/acre	Rs. 220/acre
Minor Scheme	Command areas demarcated in Cultivation Meeting	Rs. 5,000/acre	Rs. 250/acre
		Rs. 3,700/acre	Rs. 185/acre

1/: 5% of amount insured

10.7 Support Services of Agencies Related to Income Generation

The current support services rendered by the project related agricultural agencies, which are the important institutions for the income generation activities, are discussed in A 10.2 and their major support programs are shown in Table M 10.4 to 10.6. The major support activities of other project related agencies related to income generation are rather focused on vocational and technical training and credit supply for the establishment micro enterprises or self-employment needs. Generally speaking, similar support activities are introduced by different agencies and the target groups of the activities are the rural poor and the rural unemployed youth.

Chapter 11 ENVIRONMENT

11.1 General

The project areas are predominantly agricultural. Natural resource use is therefore, largely focussed on the use of land and water for the production of the basic food needs of the people. Pollution from industry is not very significant except in the case of paddy husk disposal problems.

The usual natural vegetation in the DL1 agro-ecological region, where all the proposed schemes are located, is the typical dry mixed evergreen type. However, nowhere is it extensively found, having been much disturbed over a long period of time for timber, agriculture and settlement, and only remnants are now seen. Patches of riverine vegetation are also found along the river banks, where the species composition is somewhat different to the above because of the moist conditions throughout the year. Five endemic plant species have been reported from around the Nachchaduwa tank in the wetland site report.

The watershed of the Nachchaduwa tank has as its highest point, the Ritigala Strict Natural Reserve which is a small isolated range with a number of peaks, lying to the south east of the tank; the highest peak being over 1,500 m. Floristically the reserve has a unique diversity.

Forest Department data show about 480 ha of natural forest in the Tirappane DS division scattered at six locations. There are also some plantations of mixed species and monocultures undertaken by the department during the last two decades.

The natural vegetation of the Mi Oya basin is also much disturbed. Records indicate that only 180 ha of natural forest remain in the Galgamuwa DS division where the schemes are located. There are however, varying extents of forest plantations of teak, eucalyptus, and acacia. The Sangappala teak plantation alone extends over 2,400 ha.

With the gradual elimination of the forest and grassland for agriculture and settlement, some of the larger mammals such as the leopard and bear and the more mobile species of other animal families have been pushed into neighbouring high forests while the elephant has chosen to remain and fight for its rights through regular depredations into cultivated land. It has been pocketed among cultivation and settlements in certain areas.

Yet some of the smaller animals and some bird species appear to have adapted themselves to the changing habitat with no visible reduction in population size. Reportedly threatened species are the elephant, leopard and mouse deer. The

endemic bird species reported are the spur fowl, jungle fowl, grey hornbill, lori-keet and the brown-capped babbler.

The project areas are steeped in history, culture and archaeological sites. Consultation with the Department of Archaeological Survey has been initiated and project activities are not believed in anyway to disturb existing monuments and places of worship.

11.2 Current Environmental Issues

The environmental issues discussed below are common to all Priority schemes. Some differences are observed in the magnitude of effect. Most of these issues have also been identified and discussed at the Farmer Organisation meetings.

11.2.1 Land Use Planning

The implementation of the Accelerated Mahaweli Development Scheme (Mahaweli Project) in the 1970s and 80s brought about many ecological changes to large extents of the dry zone. The biggest change came about through a reduction in the natural forest area, which was also wildlife habitat, by its conversion into agricultural systems and settlements. Consequently, displacement of many species of wildlife from their natural habitats took place. .

The elephant has been trapped in an ever reducing habitat that makes it very difficult for the animal to obtain the large quantities of food which it requires on a daily basis, without having to consume farm produce, even paddy stored in houses. In spite of setting up a number of protected areas under the Mahaweli Environment Programme, the problem appears to be increasing in intensity. Quite clearly the present day carrying capacities of the existing habitat in relation to the current elephant population is inadequate.

Inappropriate land use planning at the macro-level has therefore, brought into sharp focus the human-elephant conflict as seen at the present time. At the micro-level too, land use planning plays an important role. The tank-village system of farming that was the basis of settlement of an ancient civilisation, depended entirely upon irrigated agriculture from stored runoff in small village tanks. The entire system was based on numerous ecological linkages that integrated land and water use and human endeavour together with fundamental principles of conservation. These concepts are relevant even at the present time.

The tanks in the Mahananneriya minor scheme group (cascade) do not receive adequate water from runoff, which is derived primarily from individual catchments. This is because the rainfall quickly runs off the catchment because of

poor land management and the tanks are silted, and cannot hold the water. Therefore catchment land use and management will be determining factors in the hydrology of the micro-catchment. .

11.2.2 Soil Erosion on the Rainfed Uplands

Soil erosion is quite common on the rainfed uplands and home gardens. The erosive processes will finally lead to the silting of waterways and tanks particularly the minor village tanks as seen in the Mahananneriya minor scheme group. Continued erosion also depletes soil fertility and reduces productivity, making farming unprofitable. Hence, on eroded farm land, large amounts of inputs are required to keep production at reasonable levels.

Loss of top soil and the exposure of sub-soil makes farming uneconomical. The most visible sign of loss of top soil is the exposure of tree roots. MI workers recognise the loss of top soil in the rainfed uplands as a factor for declining agricultural productivity. They also report that only 50 percent of the production potential of the upland farm is being achieved. The loss of top soil is also associated with other concerns such as depletion of nutrients, organic matter and soil structure. Therefore, land degradation should be recognised as amounting to something more than the physical loss of top soil.

MI studies also indicate that although the total amount of *yala* rainfall is less, the falls are more intensive and erosive when compared to the *maha* falls. The percentage of erosive rain is 70 in *yala* and 50-55 in *maha*. The months of March and September have a high erosion risk. Undulations in the topography are said to make large variations in erosion even within a micro-watershed.

Erosion by water begins with the detachment of soil particles and the subsequent transport by water from the point of generation to the point of deposition. The energy of falling rain drops on a bare soil surface determines the beginning of a series of erosive processes. Other contributing factors are intensity of rainfall, runoff, susceptibility of soils, topography, soil cover and cultivation practices. In this report, the concern is for loss of soil by water, although a limited loss by wind is also a factor during the long *yala* season, when strong drying winds blow across the dry zone from the south-west.

As the Reddish-brown Earths are erosion-prone, conservation measures are required when these soils are used for the cultivation of field crops. The magnitude of soil loss on the well drained, Reddish-brown Earths has been estimated at a few dry zone locations with the help of erosivity values. The table below shows the potential annual soil loss (t/ha) from an open field, 100 m long,

on land slopes of 2, 4 and 6 percent at three locations in the Master Plan Study area, namely, Anuradhapura, Galgamuwa and Maha Illuppallama. These are indicative to the Priority schemes as well. The values have been computed using the Universal Soil Loss Equation and the plots had no protection of vegetation at the time the trial took place. In a real situation, the results can be different on account of the presence of a crop cover or a mulch.

Potential Annual Soil Loss on the Reddish-brown Earths

Location	2 %slope	4%slope	6 %slope
Anuradhapura	27	52	84
Galgamuwa	26	51	83
Maha Illuppallama	25	48	78

Source: P.B.Dharmasena.1992. Rainfall Erosivity and Potential Erosion in the Central Dry Zone. Tropical Agriculturist. Vol.148; pp 111-120.

11.2.3 Sedimentation of Minor Tanks

Sedimentation of minor village tanks is a serious problem in the Mahananneriya minor scheme group (cascade) made up of the following six tanks – Kallanchiya, Arthikulama, Palumailewa, Ihalagama, Thambarewewa, and Ihala Nanneriya. All tanks show a high degree of sedimentation and hence, a generally reduced storage capacity.

A study carried out in three small village tanks in the Maha Kanumulla small watershed by MI workers has shown that the total volume of sediment deposited in the tanks varied from 23 to 35 percent of the potential tank storage. The rate of sediment generation was 3,200 and 6,000 m³/km²/year for two of the three tanks. The impacts of this relate to the degradation of the catchment making it progressively less productive, decreasing storage capacity of the tank and the reduction in the extent of the command area of the command area under a *yala* season cultivation. Section 3.8 also refers.

11.2.4 Soil Salinity

The salts found in agricultural soils are generated from soil minerals and are carried to the fields in the irrigation water. Sodium and chloride are the dominant ions that make the water in the soil less available to plants. Salinisation can occur when there is poor drainage and the salts are not carried away or when evaporation brings up salts from the lower layers of soil and deposits in the surface layer, as can happen in arid areas. Salinisation can also occur when sea water enters the river systems and move upstream due to changes in river hydrology.

Salt content in water is usually expressed in terms of electrical conductivity (EC). Water quality analytical data so far available does not indicate an excessive salt content in the irrigation water. The data referred to are drawn from the COWI consult (a consulting company) Anuradhapura water supply study of 1993, routine water analyses of the National Water Supply and Drainage Board (NWSDB), Anuradhapura, and the North Western Province (NWP) water resources development study of 1997. No water analyses have been undertaken during this Study

According to the rapid rural appraisal, 13 percent of farmers in major schemes believed there was a problem of salinity. Localised incidence of soil salinity has been reported from a number of locations. It is primarily due to waterlogging because of the poor drainage conditions.

The localised cases of salinity reported are often from the *yayas* where the field drainage channels have been encroached and the free flow of drainage water prevented. The drainage channel (S: *kunu-ela*) was in the early days an integral part of the *yaya*. It was well maintained so that water carrying excess salts and nutrients was taken away quickly from the *yaya*.

Waterlogging can also be the result of high water use in paddy cultivation. Farmers in Sri Lanka are also known to use irrigation water quite freely as often it is a free resource. Under such conditions crop plants find it difficult to absorb all the required nutrients. The soil oxygen levels are low and toxic compounds may develop in the soil.

11.2.5 Pesticide Use

Health problems among the farming population from pesticide misuse are always a possibility. In fact in the country as a whole, acute pesticide poisoning is a major health problem. Some of the causes are due to improper handling and storage in the home, when spraying is undertaken without the necessary precautions such as body protection, consuming food and drink while spraying and inadequate personal hygiene on completion of the work. In the Priority schemes paddy is the largest user of pesticides. Considerable amounts are also used in vegetables and tobacco.

Excessive use of pesticides is known to cause a number of adverse effects such as the death of non-target beneficial species in the field, accumulation of residues in the environment and the build-up of pesticide resistance in target species. The resistance of the mosquito in Sri Lanka in recent times, to DDT at first, and then to malathion that replaced DDT, is a good example.

Increase in pesticide use is partly due to reduced efficiency, resulting from ecological changes in the field brought about by repeated heavy dosing. This has brought about the condition known as the “pesticide treadmill,” when pest resurgence and the use of more and more toxic pesticides make pest control uneconomic.

On application, pesticides undergo many changes. Some are broken down very quickly and leave no undesirable effects. Others are more persistent and toxicity levels continue over varying periods of time depending upon many external factors. Sunlight decomposes some chemicals. Some get absorbed by plant parts. Others are washed into the soil and dissolve in the soil solution through which plants may absorb the chemicals. Some chemicals are adsorbed by soil colloids and may be decomposed in the soil due to chemical and biological processes. Some leach downward into surface and ground water or are carried in the drainage water.

In the last few years some of the toxic pesticides such as DDT, aldrin, endrin and dieldrin have been withdrawn. There is at present some control of pesticide use in the country through the Control of Pesticides Act of 1980. The Department of Agriculture approval of pesticides is made after much screening and testing. The new generation of pesticides are much safer formulations, are pest specific and are required in low dosages, when compared to some of the chemicals used many years back.

Preliminary analyses carried out by COWI consult in 1993, of surface and ground water in large paddy tracts of the Anuradhapura District, in connection with a drinking water supply and sanitation study, did not detect any pesticide residues. Residues of carbamates, organo-phosphates, organo-chloro and pyrethroid pesticides had been analysed for, in this study.

Pesticides were also not detected in the water analyses of the NWP Water Resources Project. Here 19 pesticides were tested for.

“ Insect pests of most crop plants have many natural enemies whereby an equilibrium situation of the pest population and natural enemies is reached with the pest not being able to reach proportions of large scale infestation. Based on this natural phenomenon, integrated pest management (IPM) methodologies now provide opportunities for minimising pesticide use and increasing profits and making the environment safe.”

Agrochemicals are applied to prevent crop losses by insect pests. The Department of Agriculture has estimated crop losses of between 20 and 30 percent of the total yield due to insect damage. The most commonly used agrochemicals are

insecticides and weedicides. For example, according to a Department of Census and Statistics, in the Anuradhapura District, insecticides were used in over 70 percent of the sown paddy area during *maha* 1997/98 and *yala* 1998. It is doubtful whether all this amount of chemical was really necessary. The work done on chilli described below confirms these doubts, although the crop is different. Weedicide use was reported to be particularly high in the Anuradhapura District and in System-H.

It is still common practice to see farmers spraying pesticides without the minimum bodily protection, in unsuitable weather and consuming food and drink during breaks in spraying. This is largely due to a lack of awareness.

The table below shows the average pesticide usage in the Nachchaduwa major scheme based on an interview survey of 50 farmers. This scheme had the highest use rate among all the Priority schemes for both *maha* and *yala* seasons.

Average Pesticide Use in Paddy: Nachchaduwa Major Scheme; *Yala* 98 and *Maha* 98/99

Chemical	Form	Unit	<i>Maha</i> irrigated	<i>Yala</i> irrigated
Weedicide	Liquid	Litre/ha	3.34	3.0
Insecticide	Liquid	Litre/ha	0.67	0.90
	Powder	Kg/ha	0.20	2.20
Fungicide	Powder	Kg/ha	2.50	1.40

Source: Interview Survey, 1999.

In a 1994 study of pesticide use on chilli, MI workers reported some interesting findings that prove that there is indiscriminate use of pesticides. These are:

- The number of pesticide applications were high;
- 46 percent of the farmers used pesticides more than 10 times during the season while some used more than 20 times;
- Farmers are of the opinion that 15-20 applications are needed from field planting to harvesting;
- Higher rates than recommended were used by 56 percent of the farmers;
- Frequency of application is at very short intervals;
- Some farmers applied sulphur even without the presence of mites; and,
- Pesticide application of this nature led to the destruction of natural enemies of chilli pests.

Indiscriminate application has increased the cost of production of agricultural produce and interfered with the balance of nature. More rational use will necessarily bring about reduced cost of production, better incomes and improved environmental quality.

All farmers do not follow the recommendations of the Department of Agriculture.

Some of them are in the habit of deciding by themselves on what should be applied. Often farmers are advised by the village boutique keeper. They are also influenced by propaganda carried out by agrochemical companies, among whom there is much competition.

Hence, the most cost-effective and environment-friendly method of pest management technology available, may not be always used. This is also a reflection on the extension system. Some of the active ingredients in most chemical compounds can lead to environmental degradation when used in excess, by eliminating beneficial insects, fish, amphibians, birds and soil organisms.

Although fears of pesticide pollution of water bodies have been expressed from time to time, pesticide residues in water bodies in the Priority areas have not been detected in recent analyses undertaken in the Nachchaduwa Tank and Attaragalla Tank.

The ill-effects of intensive pesticide use takes place in ways other than polluting of water bodies. They also happen due to careless handling and storage in the home and in the field. For example, children and adults have inadvertently consumed pesticides mistaking for other items of drink because of the similarity of containers used. Often after spraying in the field, the empty containers are carelessly thrown away into waterways. After finishing work the equipment is washed in the canal which is also a source of water to other people.

Very briefly the ill-effects are as follows:

- Acute and chronic poisoning of humans which is a major problem in Sri Lanka;
- Resistance developed by pests to certain chemicals;
- Destruction of beneficial insects and other predators of crop pests in the field;
- Impacts on fish and other aquatic life.

As an illustration of the impacts of all classes of pesticides on humans, the statistics from the Anuradhapura General Hospital are shown below. The results are only indicative. Death (mortality) due to pesticide ill-effects of all classes have been 29, 21 and 21 percent of admissions in the years 1997, 1998 and 1999 respectively. Live discharge shows the numbers of affected people (morbidity) who left the hospital after being cured. The places where the patients live were not on record at this office but may be determined by examining the bed-head tickets. It is likely that among the total admissions there were patients also from the two Priority scheme areas of Nachchaduwa and Periyakulama which are not very far away from the hospital. It is also not known whether the cases are effect is accidental or intentional (suicide).

**Pesticide Poisoning: Mortality and Morbidity at the General Hospital,
Anuradhapura 1997-1999**

Year	Total admissions	Live discharges	Deaths	Deaths as % of total admissions
1997	547	387	160	29.2
1998	854	674	180	21.0
1999	758	598	160	21.1

Source: Statistics Division, General Hospital, Anuradhapura

Similar data from the Galgamuwa District Hospital are shown below. The effects are on a much lesser scale. The major scheme of Palukadawala, the medium scheme of Mahananneriya and the Mahananneriya minor scheme group (cascade) are the Priority schemes not very far from the hospital. Being the best equipped in the area, it is likely that the hospital had among its admissions, people from the Priority areas as well. However, the data are again only indicative.

**Pesticide Poisoning: Mortality and Morbidity at the District Hospital,
Galgamuwa 1997-1999**

Year	Total admissions	Live discharges	Deaths	Deaths as % of total admissions
1997	76	70	4	5.2
1998	85	75	10	11.7
1999	71	69	2	2.8

Source: District Hospital, Galgamuwa

Note: Live discharges and deaths should equal hospital admissions. However, serious patients are sometimes transferred to hospitals with better facilities, as happened in 1997, when 2 patients had been transferred.

A reduction in pesticide use is a distinct possibility. This is indicated in the reports of the IPM programme for paddy, promoted by the Department of Agriculture through Farmer Field Schools (FFS). These schools have been conducted in many districts during the last few years. A programme for chilli has also been just introduced.

Some farmers who had participated in IPM training programmes for paddy, interviewed during this Study, reported much satisfaction on following the training class. They have had new information or updated their knowledge on many aspects of paddy cultivation such as reducing the cost of production, improving cultivation techniques and above all, the satisfaction that they are no longer being subjected to a slow poisoning.

11.2.6 Water Quality

Multiple uses of surface water are common in irrigation schemes. Non-agricultural uses are for washing, bathing and even drinking. However, there are health risks involved. The health risks are possibility of typhoid, cholera, problems due to nitrates and worm infestations. Hence, the need for good quality water places responsibility on project managers.

Water quality is important for irrigation, domestic and recreation purposes. A Sri Lankan Standard has been formulated for drinking water and another is in preparation for irrigation. Few analytical studies of dry zone surface water have taken place and these have been for specific purposes.

Adverse impacts of poor water quality may interfere with the realisation of project objectives, eg. achieving the targeted paddy yield if the water has too much salts. Impacts can also be experienced by people living in downstream areas outside the designated project. Examples of such are, sediment carried in the river and deposited in downstream floodplains, the spread of water weeds and transmission of various diseases. There are also other undesirable chemical elements and compounds that are carried in solution by the rivers that may affect the health of the people and the environment.

Deterioration of surface water quality can take place by the addition and accumulation of toxic substances, sediment, changes in colour, depleted oxygen, bacteriological contamination, agricultural runoff and industrial effluents, amongst others. Agricultural runoff carries with it plant nutrients and pesticide residues, among other constituents such as organic matter and sediment. Agricultural runoff is from non-point sources.

Suitability of irrigation water for crops depends upon several factors. These are, the origins of sources of water, climate, soil and weathering characteristics, and plant tolerance to salt in the soil. These factors interact in determining crop performance. During the flow of water, different soluble salts get dissolved in the water and in excess, can lead to soil salinity when prolonged dry conditions or waterlogging are present. With evaporation, there is capillary movement of water upwards in the soil and dissolved salts may reach the upper soil layers and be left behind as the water evaporates.

The adverse effects of water quality on the soil-plant system depends upon factors such as the total salt concentration in irrigation water, relative proportions of cations and anions, soil characteristics and crop tolerance. When salinity builds up in the command areas of an irrigation scheme, the effects can also be felt in the downstream command areas of other schemes, using the return flows. Crop yields are adversely affected.

The major chemical components of irrigation water are sodium, calcium, magnesium, chloride, bicarbonate ions, nitrate and potassium. Of those present in small amounts, most do not affect the quality of irrigation water. Selenium, molybdenum and fluoride among these, may be harmful to humans.

When the sodium content in irrigation water is high, it will make soils unsuitable for cultivation because of unsatisfactory physical condition. At high levels sodium is toxic to plants. However, its ill-effects are avoided by high levels of calcium and magnesium in the soil. The sodium adsorption ratio that takes into account the relative proportions of the three elements, is an index for the classification of irrigation water.

Water quality in downstream areas can deteriorate when water leaving a particular irrigation scheme as a return flow after irrigation, rejoins the main stream carrying with it high quantities of the plant nutrients, nitrates and phosphates, and perhaps pesticides. These are the major pollutants that are responsible for the pollution in water bodies. The nitrates and phosphates will cause algal blooms in enclosed water bodies and give rise to eutrophication. In this situation fish life will not be possible due to the absence of oxygen. The dissolved oxygen is used up by the plant decomposing bacteria and therefore oxygen levels in the water will be much reduced or eliminated altogether, when the water smells bad.

Urea and ammonium fertilisers are generally nitrified to nitrates which are not fixed by soil minerals and are carried in the drainage and percolating water. Nitrates as such are not harmful to human health. The ill-effects of excess nitrates occur when nitrates are converted to nitrites by bacteria in the intestine. Nitrites are absorbed into the blood stream and are detoxified by adults. However, babies are unable to do this and nitrites combine with haemoglobin in the blood and reduces the absorption of oxygen by red blood cells. This condition is known as methemoglobinaemia, also called the “blue baby syndrome.”

Increased nitrogen and phosphate levels in tank water, particularly in the small tanks, provide ideal conditions for the growth of water weeds. Beginning with the free floating salvinia and water hyacinth, rooted macrophytes such as lotus, water lilies, grasses and sedges will begin to spread in the tank and finally may cover the entire area making it useless for irrigation and domestic use.

Salvinia molesta, salvinia and Eichhornia crassipes, water hyacinth, are two floating weeds that cause serious problems in small irrigation tanks in particular, canals and even paddy fields. Water weed problems are largely seen in the Mahananneriya minor scheme group (cascade) and to a lesser degree in the large tanks. The medium tank of Periyakulama has an extensive cover of water weeds.

Water weeds grow very rapidly, particularly when large inflows of plant nutrients enter tanks. *Salvinia* is more common in its distribution and is reported to multiply by division every two days under favourable conditions. Among a variety of other rooted water plants found in the water bodies, *Nymphaea lotus*, *lotus*, *Aponogeton crispus*, *Limnophyton sagitifolia*, *Paspalum mertzii* and *Nymphaea stellata*, water lily, are also common. Some of the sedges are of economic value and provide plant parts for cottage industries.

The economic and social costs of water weed problems can be quite high. The Department of Agriculture has estimated a loss of 2-3 percent of total yield of paddy on account of water weed infestation.

COWI consult work carried out in 1993, concluded that surface and ground water in the Anuradhapura District showed the presence of nitrate, ammonia and phosphate, derived very likely, from high fertiliser use in crop husbandry. Pollutants were more prevalent in dug wells than in tube wells, as to be expected, because dug wells are fed by the upper portion of the ground water aquifer. The wells with high concentrations did not follow a general pattern, supporting the assumption that the anomalous values were not caused by hydrogeological factors. It was also concluded that the nitrate concentration in the Anuradhapura District as of that time, did not pose a health risk. No pesticide residues were detected in this study.

The NWSDB monitors sources of drinking water supply at a number of locations in and around the Priority schemes. The analytical data for Nachchaduwa Tank water, undertaken in 1993 by the National Aquatic Resources Agency (NARA) and NWSDB results in 1999 are presented in Table M 11.1, in comparison with the Sri Lanka Standard for drinking water.

Certain parts of the Nachchaduwa and Periyakulama Priority schemes have high levels of fluorides in surface and ground water. In parts of the country such as the wet zone with a high rainfall, it is believed that the fluorides are easily leached and moved away. Compounds of fluorine are also present in mineral deposits such as fluospars or apatite.

According to the NWSDB, at concentrations of 1.0-4.0 ppm fluorides will cause the discolouration of teeth in children under five years. However, if the concentration is below 0.5 ppm, dental caries will result. While adults are more or less unaffected healthwise at concentrations when children are affected, skeletal fluorosis can occur in adults when the concentration is between 4-10 ppm.

Analyses carried out for the Asian Development Bank (ADB) Water Resources Development Project in the North-Western Province (NWP), indicated that

surface water (tanks and rivers) and ground water (domestic and agrowells) are of good quality for agricultural use. Nitrates, phosphates and chlorides were well below the maximum desirable levels for drinking water.

No pesticide residues were detected. However, bacteriological tests of ground water showed a high contamination of Eschericia coli, faecal bacteria.

The water quality data for Attaragalla Tank undertaken during 10 months in 1997 are presented in Table M 11.2. This Tank and the Palukadawala Tank are interconnected and similarity in the water quality can be expected. However, this is only indicative.

However, levels of over 3,000 uS/cm have been reported for the Mahnanneriya area in the wetland site report on the Mi Oya River Basin. The maximum desirable level in the Sri Lanka Standard is 750 uS/cm and the maximum permissible level is 3,500 uS/cm. At farmer meetings the people have confirmed that the water in the dug wells is of poor quality during most months of the year.

11.2.7 Public Health

Diseases associated with water are of common occurrence in most developing countries where irrigation is practised or where access to good quality water is not available. This is so in Sri Lanka as well. However, it does not mean that all irrigation schemes need experience such ill-effects. There are ways of overcoming these.

Most of the disease causing agents that contaminate water are biological in nature. These include types of bacteria, viruses, protozoa and helminths that enter the human body through food and water. The organisms reach different stages of development within the body and on excretion with the faeces, contaminate water bodies and re-infect people, as many people in rural areas depend upon open water bodies for domestic need. Poor sanitation is largely contributory. The disease causing organisms can survive for long periods in human sewage.

For purposes of classification of water-associated diseases, the World Health Organisation (WHO) cites four classes. These are as follows:

Water-borne: various pathogens contaminate water through infected faeces and urine. Cholera and typhoid are two examples prevalent from time to time in the Priority areas but are easily controlled. Diarrhoeal diseases are mostly responsible for mortality in infants. These are likely to arise in the future too.

Water-washed: this class is common when water is scarce for domestic use. Skin and eye infections are common. Conjunctivitis (eye infection) sometimes

appears in project areas.

Water-based: worm infestations in humans where the parasites use water dependent intermediate hosts to pass part of their lifecycles. These are also common.

Water-related: the vectors responsible for diseases such as malaria, dengue and Japanese encephalitis require water to pass part of the lifecycle. Malaria is the most prevalent disease in project areas and could remain so unless the routine precautions are not taken. The other diseases have also been reported periodically but have not assumed serious proportions. There are over a hundred species of mosquito and they vary in their preference of water. For example, the malaria mosquito requires clean water.

Of all the water-associated diseases, malaria has the most damaging economic impact on the farming population. WHO describes malaria as the “world’s most important tropical parasitic disease.” The incidence of the disease is greater towards the end of the year when the monsoon begins and creates conditions suitable for the mosquito to breed. Again at the end of the monsoon when reducing rainfall and diminishing canal flow leave pools of water, malaria is common.

A family when affected is likely to lose a season or more of cultivation. Hence, the poor may get poorer. Children are also affected.

Symptoms of malaria are fever, headache, joint pain, shivering and vomiting. If neglected, the disease can lead to death. The disease as caused by Plasmodium falciparum can be particularly severe. Pregnant mothers are very susceptible to the disease.

The malarial parasites are transmitted among humans by the female anophelene mosquito. The male feeds on plant juices and does not transmit the disease. The parasite develops in the intestine of the mosquito and is passed on to humans when feeding. The parasites are then carried to the liver of the human where they multiply into another stage. After some days the parasites invade the red blood cells and multiply again causing fever and anaemia. The brain and other body organs may also get affected. Diagnosis is by clinical symptoms and blood examination.

A 1997 study carried out in a small tank-based irrigation scheme in the Huruluwewa basin of the Anuradhapura District showed that the total average annual cost per household from the incidence of malaria amounted to about 10 percent of the net household income. Studies have also shown that Japanese encephalitis, which had two major outbreaks in the NCP and NWP in the 1980s,

could be linked to vector breeding in paddy fields.

Of the public health issues, vector-borne diseases are the most prevalent, and of these, malaria stands out as affecting the largest number of the population. It also has its impact on the physical condition of the people and subsequently on the economy, as a result of the number of work days lost and the cost of medication provided. The table below shows the number of admissions to the General Hospital, Anuradhapura during the period 1997 to 1999. Deaths during this period have been less than 1 percent of admissions for each year.

Malaria: Mortality and Morbidity at the Anuradhapura Hospital, 1997-1999

Year	Total admissions	Live discharges	Deaths	Deaths as % of total admissions
1997	1,959	1,940	19	0.97
1998	1,627	1,614	13	0.80
1999	1,438	1,427	12	0.83

Source: Statistics Division, General Hospital, Anuradhapura

In the case of the Galgamuwa Hospital, the admissions for 1997, 1998 and 1999 were 78, 52 and 94. There were no deaths. It is significant that the larger part of the cases were during the fourth and first quarters of successive years when the north-east monsoon is effective.

Malaria control in the country, since its introduction in 1923, has had both its successful and not so successful periods. From having brought down its incidence to almost zero level (only 7 reported cases in 1963), there had been an upward trend in the number of cases recorded, with an epidemic occurring in 1967/69. A number of reasons contributed to this situation.

Malaria can reach epidemic proportions if the basic preventive measures are not taken. However, it is reported to be presently on the decline except in the war ravaged north and east of the country.

The periodicity of malaria is primarily associated with weather conditions. Immediately after the onset of inter-monsoonal weather conditions in October, the incidence of malaria peaks. There is another small peak in mid-February, when canal and stream flow reduces and ponding may take place at this time. The tanks also have little water and water releases are therefore not possible.

Defence personnel returning from the north and east act as carriers, as in those areas, little can be done for prevention or control. There are also other interacting factors such as social status of the people; migration from non-malarial areas; design, operation and maintenance of irrigation infrastructure, and geographical location of schemes.

The table below compares the reported cases of malaria in 1997 and 1998 in the North-Western and North-Central Provinces. This data is presented for indicative purposes. The North-Eastern Province is included for purposes of comparison.

Percentage of Malaria Reported by Province; 1997-1998

Province	1997	1998
North-Western	9.5	7.1
North-Central	13.3	8.2
North-Eastern	55.8	62.3

Source: Anti-Malaria Campaign

The main vector is the mosquito, Anopheles culicifacies, although Anopheles subpictus is also a carrier. Two of the malarial parasites are Plasmodium vivax and Plasmodium falciparum. Of the parasites, the former is responsible for about 80 percent of the total cases. The latter however, is more dangerous.

A study on the “Insecticide Resistance in Anopheline Vectors of Malaria,” conducted by the Department of Zoology of the University of Peradeniya, in the Galewala area (Matale District), during 1995-98, showed a high resistance to organochlorines (eg. DDT that was used prior to 1977) and organophosphates (eg. malathion has since been discontinued) by the two mosquito species named above. Both chemicals were widely used in Sri Lanka before and were discontinued on account of the resistance developed by the mosquito. The study showed that successful control is however, possible by the use of carbamate and pyrethroid insecticides. The study also indicated that pesticides used in agriculture did not have an impact on the development of resistance in the above malaria vectors.

Snake bite is another problem of frequent happening among farmers and their family members due to the nature of the occupations and the many wilderness areas that are habitat to poisonous snakes. The chances of survival are best when a victim is taken to the nearest hospital as most hospitals are presently well stocked with anti-venom serum (AVS). This may not be the case however, when the patient is taken for local treatment by self-made physicians. The table below shows the snake bite cases admitted to the Anuradhapura Hospital. This is also indicative as not all those who are bitten by poisonous snakes are brought to hospital.

Snake Bite: Mortality and Morbidity at the General Hospital, Anuradhapura 1997-1999

Year	Total admissions	Live discharges	Deaths	Deaths as % of total admissions
1997	583	563	20	3.4
1998	788	773	15	1.9
1999	623	613	10	1.6*

* Data are for the first three quarters only

Source: Statistics Division, General Hospital, Anuradhapura

At the Galigamuwa Hospital the situation due to snake bite death is more satisfactory. In 1997 and 1999, there were no deaths while in 1998, there was one death. The prompt arrival of the patient at the hospital and the availability of the anti-venom serum were attributed to the low death rate.

Some of the poisonous snakes reported are Bungarus caeruleus, Indian krait(S: *thel karawala*), Naja naja, cobra (S: *naya*) and Vipera russelli, Russel's viper (S: *thith polonga*). These snakes are commonly found in most dry zone regions.

Snake Bite: Mortality and Morbidity at the District Hospital, Galgamuwa 1997-1999

Year	Total admissions	Live discharges	Deaths	Deaths as % of total admissions
1997	92	92	0	0
1998	120	119	1	0.83
1999	168	168	0	0

Source: District Hospital, Galgamuwa

11.2.8 Catchment Degradation

It has been observed that much of the vegetation of the catchments of the Mahananneriya minor scheme group (cascade) has been cleared for upland rainfed cultivation. Crops are grown in both *yala* and *maha* depending on rainfall availability. As generally no soil conservation is practised, eroded soil is deposited in the tanks below, thereby reducing tank capacity. The advantage of runoff collection in the tank is then not achieved as the tank is filled with sediment. No quantification of the sediment deposited in each tank has been made.

MI workers have reported that continuous cultivation of the catchment without adequate soil conservation has caused the degradation of the soil. The soil shows a poor water holding capacity, a low rate of infiltration and a high evaporation rate. They also report that crops have either given very low yields or failed completely on account of inadequate rainfall. Annual runoff from the catchment has been estimated by them to be as much as 40 percent and carries a fairly high suspended load of top soil into the tank below.

During a 10-year study from 1983-1993, MI workers observed an annual sedimentation rate of 2.4 percent in some minor tanks of the Anuradhapura District. Excessive erosion is a reflection on the catchment uses indicating poor agricultural practices. Section 3.3 also refers.

11.2.9 Deforestation

The Priority scheme areas have lost almost all of the natural forest. The Mahaweli

Project has been responsible for a large part of forest loss in the larger dry zone region. Reportedly some 200,000 ha of natural habitat have been converted into agricultural ecosystems during the 1970s and 80s. Other causes of forest loss are legal and illegal logging, and chena cultivation.

11.2.10 Problems of Wild Animals

Numerous conflicts between man and wild animals have arisen in the Priority scheme areas. There are no wildlife protected areas within or near the Priority schemes. The elephant, moves about quite freely. Its “home ranges” have been drastically reduced by the numerous development schemes that have been undertaken in the past.

Elephants take refuge during the day in patches of forest and at night, move into cultivated lands, and also damage houses in search of stored paddy and salt. Men and women, in the course of their normal day to day work, have often been injured or have even met with their death.

Crop damage by animals is caused by the elephant, wild boar, rock squirrel, monkey, toque macaque, rat, porcupine and a variety of birds. No reliable data of crop damage by wild animals are available.

Snakebite is also a big problem to farming families in most areas. For example there were on the average, over 650 persons admitted per year, to the Anuradhapura Hospital during the three years, 1997-1999. In comparison, only 126 persons per year were admitted to the Galgamuwa Hospital for the same period. The ready availability of anti-venom serum in the hospitals and early arrival of the victim at the hospital after being attacked, has greatly helped to reduce deaths. Section 3.7 on public health provides more data from the Anuradhapura and Galgamuwa Hospitals.

Of the wild animal problems in agriculture, the damage to crops, property and humans by elephants is the most serious at the present time. Indirect effects such as the fear psychosis among villagers and inability to get about their day to day business when elephants have entered the village or nearby areas. One never knows when they would move out. May be in a day; may be in two days. Children cannot go to school and the sick cannot be taken to a doctor or to hospital. This is the real situation in a rural setting. Damage control measures so far adopted by the Department of Wildlife Conservation have not brought about the desired results.

Some farmlands and entire villages are reported to be abandoned on account of elephant attacks. Farmers have often fallen into desperate economic difficulties

when crops and property are damaged. Entire families have fallen into similar situations when the head of household, usually the male, meets with an unfortunate death.

Table M 11.3, M 11.4 and M 11.5 provide information on these aspects during the period 1997-1998. They relate to the Divisional Secretary Divisions of Galgamuwa, Tirappane and Sravastipura which are the local administrative divisions for the Priority schemes selected. The Sravastipura division has been recently created and reorganisation was taking place at the time of field work. Therefore, the information is incomplete.

Wild elephants too have had their share of injury and death, caused by angry farmers resorting to extreme measures in order to safeguard themselves, their crops and property. Nooses, nail boards and trap guns are some of the devices that have been, or are being presently used. Mortality is highest from gunshot injuries, with death taking place sometimes far away and long after the first bullet hit the animal. In the meantime the animal may have been shot at a few more times and suffered over a long period from its infected wounds. Killing of animals for tusks has also taken place.

Present day numbers are too many to be supported by the food and water in the jungle areas they are now forced to live in. For that reason they damage agricultural properties. The human-elephant conflict has far-reaching economic and social consequences and warrants immediate attention. In fact the situation has worsened over the years and is a contributing factor to the poor success from farming in the Priority scheme areas.

In the *maha*, when water and food are plentiful, the animals disperse in herds of varying number, always led by a female. Single animals, and those in twos and threes are the males that are not part of any herd. In the *yala*, when water and food are both limiting, the tendency is for the animals to move closer to watering places. Receding water lines permit the growth of luscious grasses on the tank beds, as is a feature in the Kalawewa-Balaluwewa Tanks which attract the elephant.

Elephant numbers vary from place to place and from time to time, for they move over large areas in search of food and water, the availability of which is determined by the rainfall and the alternating *yala* and *maha* cultivations. Herds of elephants, made up of adult females, young and sub-adult males, establish their own habitual feeding and watering grounds referred to as "home ranges."

According to the Anuradhapura Range Office of the Department of Wildlife Conservation, elephant numbers in and around the Priority project areas;

estimated at between 260 and 340 are shown below. These are only indicative figures.

Estimated Elephant Numbers by DS Division

<u>Divisional Secretary Division</u>	<u>Estimated Elephant Nos.</u>
Tirappane-Talawa-Nuwaragampalata East	150-200
Galgamuwa	80-100
Giribawa	30-40
Total	260-340

Source: Office of the North-Western Region, Anuradhapura, Department of Wildlife Conservation,

Some compensation is available for human, property and crop damage but it takes much effort and time for the farmer to obtain it. The crop damage by the elephant and wild boar is compensated for by the Agricultural and Agrarian Insurance Board and covers damage before harvest, reported within 14 days of occurrence. The farmer is obliged to bear 20 percent of the loss. Compensation is also available for loss of crop by drought, flood, insects and disease.

Crop insurance is not generally available to those farming under the small schemes. However, if the Divisional Secretary assures availability of water in the tanks for a particular season's cultivation, then farmers can insure their crops. Some compensation for crop damage is also available from the Department of Social Services.

Compensation for loss of life and injury to humans, and damage to property is provided by the Department of Wildlife Conservation under certain arrangements with the Insurance Corporation. The current amounts payable to the closest relative, in the event of the death of a family member are as follows:

- Head of household, Rs.50,000
- Family member over 18 years, Rs.30, 000
- Family member between 10-18 years, Rs.20,000
- Family member under 10 years, Rs.5,000

A maximum of Rs.15,000 is allowed per person for injury. Damage to a house is allowed a maximum of Rs.25,000 and damaged implements and a cycle will receive compensation up to a maximum of Rs.5,000.

11.2.11 Cultural Aspects

Historic sites, cultural artefacts, places of worship and other places of archaeological interest are scattered all over the dry zone of Sri Lanka. These cultural assets relate to the ancient civilisation that once was very prosperous. This is the case also in the parts of the Anuradhapura and Kurunegala Districts where

the Priority schemes are located.

Some of these sites are protected and supervised directly by the Department of Archaeology while others are looked after by the incumbents of the temples on site, that often serve as important places of worship and attract people from other parts of the country on pilgrimage. There are also documented sites that are not looked after by anybody. There can also be yet others awaiting excavation as these lie beneath the soil, jungle or under the water in tanks and canals.

As the project is one of rehabilitation of existing irrigation schemes, the fear of damage to archaeological sites will not arise, as might be the case with a new irrigation development scheme clearing virgin or secondary jungle. The nearest regional offices of the Department of Archaeology to the priority schemes are at Anuradhapura and Panduwasnuwara. Both offices have been notified of the proposed project activities. The Anuradhapura office of the Department of Archaeology initiated a reconnaissance survey around Nachchaduwa and Periyakulama Tanks but has not forwarded its findings, although in personal communication, indications are that no threats to existing archaeological sites are expected.

The more important sites around the Palukadawala major, Mahananneriya medium and the Mahananneriya minor are Yapahuwa in the DS division of Maho and Hathikuchchiya in the DS division of Giribawa. Others are smaller sites not directly supervised by the Department. These are at Sangappala (caves and statues), Mangalagala (ruins), Kallanchiya (caves), Nochchiya (old temple and ruins), Buduruwakanda (old temple) and Tammannawewa (caves and image house). In the Galgamuwa DS division there are ruins at Enderagala and Weragala.

The Department stipulates, that in the event of discovering any artefacts, ruins or any other object of archaeological value in the course of project implementation, it should be notified immediately. This requirement shall be complied with.

11.3 Review of IEE

Basically, the objectives of the project are to help rural farming households to achieve targets of more profitable agriculture and higher standards of living through rehabilitation of irrigation infrastructure, more efficient use of water with participatory management and improvement of support services, including credit and marketing.

Of the environmental issues identified in chapter 3, one problem stands out as of

great significance to the continued success of farming in the Priority schemes. That is the human-elephant conflict. It has, over a long period of time, continued to frustrate the farming community by destroying in just one single night, the hard work of a couple of months (eg. damage to paddy or upland crops in the field or paddy stored in the house). The hard work of a few years (eg. damage to banana or young coconut) can also be damaged in a single night. A lifetime's effort also comes to an end when a house is damaged. Farmers have even paid with their lives or have been injured in the course of getting about their daily work.

Hence, it is suggested that the issue of the human-elephant conflict be resolved in a lasting manner. It is not possible to lay down guidelines for the resolution of the human-elephant problem at this stage of the Initial Environmental Examination (IEE) due to lack of adequate information and the need to discuss the subject with a number of institutions. Therefore, the human-elephant conflict needs to be studied in depth as a separate issue.

In the case of all other environmental issues listed in chapter 3, initial corrective measures and subsequent good management can bring about a more sustainable level of agricultural production. There is no need therefore, to subject these to a detailed environmental impact (EIA) assessment. These are easily mitigated through the different management options which the project will recommend and implement. Some of these issues include problems of field drainage, surface and ground water quality, catchment degradation and silting of minor tanks.

For example, the establishment and maintenance of the *yaya* drainage channel should eliminate the isolated occurrences of salinity. The preliminary water quality analysis to be conducted at the beginning of the project will be an indicator of irrigation and drinking water quality. This will then serve as the baseline reference against which future analytical data (during implementation) will be assessed. The presence of salts, nitrates, phosphates and pesticides will be indicated through this analysis. These are the major polluting constituents of water that will cause problems later if left unattended. Corrective measures are not too difficult to implement.

The degradation of the rainfed upland can again be arrested and the situation corrected through a series of agronomic practices that are very simple and implementable by the farmers. The research work that has been carried out at MI will provide the required mitigating methodologies. The adoption of good household sanitation, and co-operation with the anti-malaria campaign can minimise the incidence of malaria and other public health issues.

Resolution of the human-elephant conflict however, requires more baseline field

information than is presently available, in relation to animal ecology and a quantification of losses incurred by farmers on account of attacks. It has not been possible to undertake an exercise of this nature within the mandate of this study.

Preliminary field inquiries within the Priority schemes, by talking to farmers, wildlife field officers, and the GEF study consultant, discussions at PCM workshops and looking into records of damage, have led to the conclusion that a detailed investigation of the problem is necessary to find ways and means to a lasting solution. Hence, an EIA on the human-elephant conflict

TABLES

Table M 3.1 Socio-economic Indicators of the Project Area

	Nachcha- duwa Major Scheme	Palukada- wela Major Scheme	Periya- kulama Medium Scheme	Mahanan- neriya Medium Scheme	Mahanan- neriya Minor Schemes (Cascade)	Total
1. Villages						
(1) Number of villages (No.)	35	18	1	7	10	71
(2) Historical background of villages						
Traditional (No.)	13	6	1	1	9	30
Settlement (No.)	9	6	-	-	-	15
2. Demographic Feature						
(1) Population (No.)	21,860	7,220	1,000	2,200	2,810	35,090
(2) Household (No.)	6,860	2,170	210	510	730	10,480
(3) Family size (Person/household)	3.2	3.3	4.8	4.3	3.8	3.3
(4) Ethnic group						
Sinhalese (%)	90.0	87.4	100	98.0	100	86.1
Tamil (%)	0.1	1.0	-	-	-	0.1
Muslim (%)	9.9	11.6	-	2.0	-	13.7
Other (%)	-	-	-	-	-	0.1
(5) Farm household						
• Irrigated Paddy Field						
Idam Himi Govi (No.)	2,380	840	140	360	240	3,960
Anda Govi (No.)	660	210	30	-	190	1,090
Badu (No.)	190	50	10	150	20	420
Total (No.)	3,230	1,100	180	510	450	5,470
• Highland						
Idam Himi Govi (No.)	3,160	780	10	1,500	470	5,920
Anda Govi (No.)	-	-	-	-	-	-
Badu (No.)	-	-	-	-	30	30
Total (No.)	3,160	780	10	1,500	440	5,890
3. Farmers' Organization (FO)						
(1) Number of FO (No.)	14	7	1	1	5	28
(2) Number of member						
Total member (No.)	2,558	927	52	186	301	4,024
Average member per FO (No.)	183	132	52	186	60	144
(3) Member by land tenure						
Idam Himi Govi (%)	85.0	96.6	*	69.9	77.1	*
Anda Govi (%)	10.6	3.4	*	-	22.9	*
Badu (%)	4.4	-	*	30.1	-	*
Others (%)	-	-	*	-	-	*
(4) Year established (Year)	1982-1990	1970-1990	1984	1982	1988-1996	1970-1996
(5) Average joining ratio (%)	70	72	25	10	56	43
4. Total Farm Land						
(1) Irrigated paddy field	2,540	956	91	158	117	3,862
(2) Rainfed paddy field (ha)	413	10	-	10	66	499
(3) Highland field (ha)	957	615	81	809	541	3,003
5. Marketing and Processing Facilities						
(1) Pola (Yes/No)	Yes	Yes	No	Yes	Yes	-
(2) Rice Mill (No.)	60	19	3	10	6	98
(3) Grinding mills (No.)	22	3	2	1	2	30
(4) Storage House - Paddy (No.)	2	3	-	-	1	6
(5) Storage House - Fertilisers (No.)	6	1	-	1	1	9

Sources: Data obtained from FOs.

* : No data is available.

Table M 4.1 Paddy Harvested Area by Irrigation Schemes

(Unit: ha)

Cropping Season	Command Area*	1994/95 Maha	1995 Yala	1995/96 Maha	1996 Yala	1996/97 Maha	1997 Yala	1997/98 Maha	1998 Yala	1998/99 Maha	1999 Yala	Maha Average	Yala Average
Nachchaduwa	2,540	2,697	2,140	2,229	803	2,824	106	2,884	1,822	2,770	2,845	2,681	1,543
Periyakulama	91	34	26	73	34	81	34	85	26	30	28	61	30
Palkadawela	956	770	380	755	360	755	330	755	280	735	270	754	324
Mahananneriya	158	146	-	152	-	119	-	158	-	142	-	143	-
Kallanchiya	8	8	-	-	-	8	-	-	-	-	-	3	-
Attikulama	12	9	-	9	-	9	-	9	-	9	-	9	-
Palu-mailawewa	22	20	-	20	-	20	-	20	-	-	-	16	-
Ihalagama	29	32	-	32	-	32	-	32	-	32	-	32	-
Tambarewewa	20	36	-	34	-	34	-	34	-	-	-	28	-
Ihala-Nanneriya	26	35	-	35	-	35	-	35	35	-	-	28	7

*: Inventory study in 1st. Survey

Source : AI, ASC

Table M 4.2 Cropping Intesity by the Irrigation Schemes

(Unit: %)

Cropping Season	Command Area (ha)*	1994/95 Maha	1995 Yala	1995/96 Maha	1996 Yala	1996/97 Maha	1997 Yala	1997/98 Maha	1998 Yala	1998/99 Maha	1999 Yala	Maha Average	Yala Average
Nachchaduwa	2,540	106	84	88	32	111	4	114	72	109	112	106	61
Periyakulama	91	38	29	80	38	89	38	93	29	33	31	67	33
Palkadawela	956	81	40	79	38	79	35	79	29	77	28	79	34
Mahananneriya	158	93	-	96	-	76	-	100	-	90	-	91	-
Kallanchiya	8	100	-	-	-	100	-	-	-	-	-	40	-
Attikulama	12	75	-	75	-	75	-	75	-	75	-	75	-
Palu-mailawewa	22	92	-	92	-	92	-	92	-	-	-	74	-
Ihalagama	29	112	-	112	-	112	-	112	-	112	-	112	-
Tambarewewa	20	178	-	172	-	172	-	172	-	-	-	139	-
Ihala-Nanneriya	26	135	-	135	-	135	-	135	135	-	-	108	27

*: Inventory study in 1st. Survey

Source : AI, ASC

Table M 4.3 Paddy Yield by the Irrigation Schemes

(Unit: kg/ha)

Cropping Season	1994/95 Maha	1995 Yala	1995/96 Maha	1996 Yala	1996/97 Maha	1997 Yala	1997/98 Maha	1998 Yala	1998/99 Maha	1999 Yala	Maha Average	Yala Average
Nachchaduwa	3,848	3,798	4,051	4,684	4,987	3,544	5,064	4,912	4,912	4,426	4,572	4,273
Periyakulama	4,324	3,212	3,361	4,201	3,212	3,954	3,212	1,977	2,866	3,954	3,395	3,459
Palkadawela	3,339	3,875	3,396	3,240	3,941	4,100	4,096	4,240	4,340	4,600	3,823	4,011
Mahananneriya	2,595	-	3,113	-	3,113	-	3,462	-	3,459	-	3,149	-
Kallanchiya	2,050	-	-	-	1,538	-	-	-	-	-	718	-
Attikulama	3,556	-	3,667	-	3,778	-	3,778	-	3,333	-	3,622	-
Palu-mailawewa	3,262	-	3,534	-	3,370	-	3,534	-	-	-	2,740	-
Ihalagama	3,262	-	3,370	-	3,534	-	3,534	-	3,262	-	3,392	-
Tambarewewa	3,262	-	3,370	-	3,534	-	3,682	-	-	-	2,769	-
Ihala-Nanneriya	3,262	-	3,370	-	3,534	-	3,534	3,370	-	-	2,740	674

Source : AI, ASC

Table M 4.4 Paddy Production by the Irrigation Schemes

(Unit: MT/Scheme)

Cropping Season	1994/95 Maha	1995 Yala	1995/96 Maha	1996 Yala	1996/97 Maha	1997 Yala	1997/98 Maha	1998 Yala	1998/99 Maha	1999 Yala	Maha Average	Yala Average
Nachchaduwa	10,378	8,127	9,030	3,761	14,083	376	14,605	9,041	13,606	12,592	12,340	6,779
Periyakulama	149	85	245	145	260	136	273	52	87	112	203	106
Palkadawela	2,570	1,473	2,563	1,166	2,975	1,353	3,091	1,187	3,189	1,242	2,878	1,284
Mahananneriya	380	-	473	-	372	-	546	-	490	-	452	-
Kallanchiya	16	-	-	-	12	-	-	-	-	-	7	-
Attikulama	32	-	33	-	34	-	34	-	30	-	33	-
Palu-mailawewa	66	-	72	-	68	-	72	-	-	-	55	-
Ihalagama	106	-	109	-	114	-	114	-	106	-	110	-
Tambarewewa	92	-	95	-	100	-	104	-	-	-	78	-
Ihala-Nanneriya	75	-	78	-	82	-	82	78	-	-	63	16

Source : AI, ASC

Table M 4.5 Paddy High Yielding Action Plan

1. End the cultivation during the same period.
 - Maha Harvesting should be done during Feb 15 to Mar 15
2. Good land preparation:
 - Deep ploughing
 - Turing the soil
 - Good leveling
3. Organic Manure Use
 - Rice Straw
 - Green Manure
 - Cowdung
4. Suitable Variety Selection
 - Suitable for area
 - Suitable for time
 - Suitable for soil
 - According to irrigation facilities(water availability)
5. Quality Seed Use
6. Required Planting Density/Sowing
7. Straight Fertilizer Use
8. Weed Control
9. Pests & Diseases Control (IPM)
10. Basic Post-harvest Techniques
 - Prevention of crop waste and damages
11. Fertilizer application
 - Fertilizer recommendation by target yield and maturity types

Fertilizer Recommendation by Target Yield and Maturity Types

Target Yield :	6 MT/ha(120 bu./acre)			7 MT/ha(140 bu./acre)		
Variety: 3 month						
Fertilizer Application (kg/ha)	Urea	TSP	MOP	Urea	TSP	MOP
1: Basic Application	49	86	37	49	111	37
2: 3 weeks after sowing (2 wks after Transplanting)	62			74		
3: 6 weeks after sowing (4 wks after transplanting)	148		12	185		37
Total	259	86	49	309	111	74
Variety: 3 1/2 month						
Fertilizer Application (kg/ha)	Urea	TSP	MOP	Urea	TSP	MOP
1: Basic Application	49	86	37	49	111	37
2: 3 weeks after sowing (2 wks after Transplanting)	62			74		
3: 7 weeks after sowing (5 wks after transplanting)	148		12	185		37
Total	259	86	49	309	111	74
Variety: 4 month						
Fertilizer Application (kg/ha)	Urea	TSP	MOP	Urea	TSP	MOP
1: Basic Application	49	86	37	49	111	37
2: 3 weeks after sowing (2 wks after Transplanting)	62			74		
3: 6 weeks after sowing (5 wks after transplanting)	49			49		
4: 9 weeks after sowing (7 wks after transplanting)	99		12	136		37
Total	259	86	49	309	111	74
Variety: 4 1/2month						
Fertilizer Application (kg/ha)	Urea	TSP	MOP	Urea	TSP	MOP
1: Basic Application	49	86	37	49	111	37
2: 3 weeks after sowing (2 wks after Transplanting)	62			74		
3: 6 weeks after sowing (6 wks after transplanting)	49			49		
4: 10 weeks after sowing (8 wks after transplanting)	99		12	136		37
Total	259	86	49	309	111	74

Table M 4.6 Paddy Variety Recommended in the Study Area and their Attributes

Variety	Maturity Type	Year Released	Recommended for	Maturity days	Recorded high yield (t/ha)	Attributes
1) BG 379-2	4 - 4 1/2 month	1980	General Cultivation	135	8.5	Resistant to BPH & BB
2) BG 450	4 - 4 1/2 month	1985	General Cultivation	130	6.0	Samba grain, Resistant to GM-1
3) BG 400-1	4 - 4 1/2 month	1980	General Cultivation	130	8.5	Wide adaptability, Resistant to GM-1 & BB, Moderately tolerant to iron toxicity
4) BG 403	4 - 4 1/2 month	1993	General Cultivation	120	8.0	White pericarp, Resistant to GM-1
5) BG 357	3 1/2 month	1997	Inlandwide cultivation	106	9.55	Resistant to BPH, GM-1, GM-2, MR to thrips,bronzing(iron toxicity), low temperature, R/MR to BL, White pericarp, L/M
6) BG 353(352)	3 1/2 month	1992	General Cultivation	105	6.0	Resistant to BL & BPH, White pericarp, Intermediate bold type grain
7) LD 355	3 1/2 month	1994	Southern province	105	4.5	Samba grain, Resistant to BL & BLB
8) BG 350	3 1/2 month	1986	General Cultivation	105	8.5	Red pericarp, Resistant to GM-1
9) AT 353	3 1/2 month	1992	Saline area	90	6.5	Red pericarp, MR to BL & BB, Good for potential acid saline condition(Nilwala)
10) BG 359(24-26)	3 1/2 month					Samba grain, Better than LD355
11) BG 300	3 month	1987	General Cultivation	90	7.0	Resistant to GM-1, BPH, BL & BB
12) BG 276-5	3 month	1979	General Cultivation	90	7.0	Resistant to GM-1
13) BG 304	3 month	1993	General Cultivation	85	7.4	White pericarp, Resistant to GM, BL & BLB

BB: Bacterial bright
 BL: Blast
 BPH: Brown plant hopper
 BLB: Bacteria leaf bright

GM-1: Gall midge (Biotype 1)
 GM-2: Gall midge (Biotype 2)
 MR: Moderate resistant
 R/MR: Relatively moderate resistant

Table M 4.7 OFC Farmers' Interest on OFC Cultivation - PCM workshop participants

Nachchaduwa (Low level)		Nachchaduwa (High level)		Nachchaduwa (Seasonal)		Palkadawela(Tr. 2, 3)		Palkadawela(Prana)		Palkadawela(Tr. 4, 5, 6)		Periyakulama		Mahananneriya		Kallanchiya Arthikulama	Ihalagama Tambarewewa
																Palu-mailawewa	Ihala-Nanneriya
1 Chilli	46%	1 Chilli	43%	1 Chilli	100%	1 Chilli	89%	1 Chilli	97%	1 Chilli	96%	1 Chilli	100%	1 Chilli	100%	1 Chilli	100%
2 Red Onion	38%	2 Red Onion	10%	2 Red Onion	56%	2 Red Onion	47%	2 Red Onion	63%	2 Red Onion	74%	2 Red Onion	67%	2 Red Onion	0%	2 Red Onion	32%
3 B'Onion	8%	3 B'Onion	33%	3 B'Onion	44%	3 B'Onion	11%	3 B'Onion	20%	3 B'Onion	41%	3 B'Onion	81%	3 B'Onion	0%	3 B'Onion	87%
4 Cowpea	0%	4 Cowpea	0%	4 Cowpea	33%	4 Cowpea	0%	4 Cowpea	67%	4 Cowpea	89%	4 Cowpea	95%	4 Cowpea	100%	4 Cowpea	58%
5 Greengram	15%	5 Greengram	5%	5 Greengram	22%	5 Greengram	0%	5 Greengram	63%	5 Greengram	63%	5 Greengram	95%	5 Greengram	100%	5 Greengram	61%
6 Blackgram	69%	6 Blackgram	10%	6 Blackgram	22%	6 Blackgram	0%	6 Blackgram	0%	6 Blackgram	26%	6 Blackgram	52%	6 Blackgram	0%	6 Blackgram	13%
7 Soyabean	54%	7 Soyabean	48%	7 Soyabean	0%	7 Soyabean	0%	7 Soyabean	50%	7 Soyabean	0%	7 Soyabean	29%	7 Soyabean	0%	7 Soyabean	24%
8 Groundnut	8%	8 Groundnut	5%	8 Groundnut	11%	8 Groundnut	89%	8 Groundnut	77%	8 Groundnut	96%	8 Groundnut	38%	8 Groundnut	100%	8 Groundnut	92%
9 Maize	69%	9 Maize	48%	9 Maize	28%	9 Maize	89%	9 Maize	53%	9 Maize	67%	9 Maize	95%	9 Maize	75%	9 Maize	92%
10 Kurakkan	0%	10 Kurakkan	10%	10 Kurakkan	6%	10 Kurakkan	84%	10 Kurakkan	13%	10 Kurakkan	41%	10 Kurakkan	52%	10 Kurakkan	0%	10 Kurakkan	47%
11 Gingelly	23%	11 Gingelly	0%	11 Gingelly	0%	11 Gingelly	0%	11 Gingelly	30%	11 Gingelly	19%	11 Gingelly	67%	11 Gingelly	0%	11 Gingelly	0%
12 Cucumber	0%	12 Cucumber	10%	12 Cucumber	0%	12 Cucumber	21%	12 Cucumber	0%	12 Cucumber	4%	12 Cucumber	0%	12 Cucumber	100%	12 Cucumber	0%
13 Brinjal	8%	13 Brinjal	29%	13 Brinjal	17%	13 Brinjal	0%	13 Brinjal	23%	13 Brinjal	41%	13 Brinjal	33%	13 Brinjal	100%	13 Brinjal	66%
14 Capsicum	0%	14 Capsicum	14%	14 Capsicum	11%	14 Capsicum	16%	14 Capsicum	53%	14 Capsicum	33%	14 Capsicum	0%	14 Capsicum	100%	14 Capsicum	47%
15 Tomato	38%	15 Tomato	10%	15 Tomato	33%	15 Tomato	26%	15 Tomato	67%	15 Tomato	67%	15 Tomato	62%	15 Tomato	100%	15 Tomato	58%
16 Bandakka	62%	16 Bandakka	19%	16 Bandakka	11%	16 Bandakka	42%	16 Bandakka	30%	16 Bandakka	37%	16 Bandakka	52%	16 Bandakka	100%	16 Bandakka	42%
17 Battana	15%	17 Battana	5%	17 Battana	0%	17 Battana	0%	17 Battana	3%	17 Battana	44%	17 Battana	33%	17 Battana	100%	17 Battana	39%
18 Long Bean	54%	18 Long Bean	14%	18 Long Bean	39%	18 Long Bean	84%	18 Long Bean	70%	18 Long Bean	85%	18 Long Bean	76%	18 Long Bean	100%	18 Long Bean	61%
19 Bushitavo	8%	19 Bushitavo	10%	19 Bushitavo	0%	19 Bushitavo	58%	19 Bushitavo	0%	19 Bushitavo	81%	19 Bushitavo	0%	19 Bushitavo	100%	19 Bushitavo	74%
20 Kakiri	0%	20 Kakiri	19%	20 Kakiri	28%	20 Kakiri	37%	20 Kakiri	0%	20 Kakiri	26%	20 Kakiri	0%	20 Kakiri	100%	20 Kakiri	29%
21 Pumpkin	38%	21 Pumpkin	29%	21 Pumpkin	28%	21 Pumpkin	53%	21 Pumpkin	10%	21 Pumpkin	52%	21 Pumpkin	19%	21 Pumpkin	100%	21 Pumpkin	42%
22 Wing bean	0%	22 Wing bean	10%	22 Wing bean	0%	22 Wing bean	26%	22 Wing bean	20%	22 Wing bean	44%	22 Wing bean	10%	22 Wing bean	100%	22 Wing bean	45%
23 SweetPotato	15%	23 SweetPotato	19%	23 SweetPotato	0%	23 SweetPotato	74%	23 SweetPotato	0%	23 SweetPotato	44%	23 SweetPotato	0%	23 SweetPotato	0%	23 SweetPotato	13%
24 Manioc	31%	24 Manioc	29%	24 Manioc	0%	24 Manioc	47%	24 Manioc	27%	24 Manioc	56%	24 Manioc	0%	24 Manioc	0%	24 Manioc	63%
25 Luffa	15%	25 Luffa	0%	25 Luffa	0%	25 Luffa	37%	25 Luffa	43%	25 Luffa	89%	25 Luffa	5%	25 Luffa	0%	25 Luffa	53%
26 Snake gourd	38%	26 Snake gourd	10%	26 Snake gourd	0%	26 Snake gourd	11%	26 Snake gourd	0%	26 Snake gourd	30%	26 Snake gourd	0%	26 Snake gourd	0%	26 Snake gourd	11%
27 Bitter gourd	23%	27 Bitter gourd	10%	27 Bitter gourd	0%	27 Bitter gourd	11%	27 Bitter gourd	33%	27 Bitter gourd	63%	27 Bitter gourd	14%	27 Bitter gourd	100%	27 Bitter gourd	53%
28 Cabbage	0%	28 Cabbage	14%	28 Cabbage	0%	28 Cabbage	26%	28 Cabbage	0%	28 Cabbage	37%	28 Cabbage	0%	28 Cabbage	0%	28 Cabbage	0%
29 Beetroot	15%	29 Beetroot	29%	29 Beetroot	0%	29 Beetroot	21%	29 Beetroot	60%	29 Beetroot	59%	29 Beetroot	0%	29 Beetroot	0%	29 Beetroot	0%
30 Radish	0%	30 Radish	29%	30 Radish	0%	30 Radish	47%	30 Radish	37%	30 Radish	67%	30 Radish	0%	30 Radish	100%	30 Radish	87%
31 Khonol	0%	31 Khonol	0%	31 Khonol	0%	31 Khonol	0%	31 Khonol	60%	31 Khonol	4%	31 Khonol	0%	31 Khonol	0%	31 Khonol	3%
32 Leafy Vegetable	31%	32 Leafy Vegetable	48%	32 Leafy Vegetable	6%	32 Leafy Vegetable	63%	32 Leafy Vegetable	40%	32 Leafy Vegetable	11%	32 Leafy Vegetable	24%	32 Leafy Vegetable	0%	32 Leafy Vegetable	68%

Table M.5.1 Present Condition of Irrigation Facilities for F/S Respective Schemes (1/2)

Name of scheme	Nachchaduwa	Palukadawela	Periyakulama	Mahananneriya	Kallanchiya	Arthikulama	Mailewa	Iharagama	Thambare	Nanneriya
(1) General										
1) Year the scheme was constructed	Ancient	1958	N.A.	1885	1800	N.A.	N.A.	1890	N.A.	N.A.
2) Command area										
1. Gross (ha)	2,540.0	956.0	91.0	157.9	8.1	12.1	22.0	29.0	20.2	26.0
2. Net (ha)	2,383.0	820.0	81.0	157.9	8.1	12.1	18.2	28.3	18.2	10.7
(2) Hydrology										
1) Catchment area (km2)	611.260	18.131	12.950	36.261	1.736	2.331	2.849	4.221	5.257	7.122
2) Inflow come from catchment area only	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3) Catchment yield as per Iso-yield curves for Maha	90.082	2.937	2.080	5.181	0.248	0.333	0.407	0.603	0.752	1.018
4) Catchment yield as per Iso-yield curves for Yala	12.340	0.474	0.309	0.834	0.062	0.056	0.068	0.100	0.125	1.070
5) Extent of tank reservation area (ha)	1871.24	261.02	82.96	135.16	4.45	9.31	13.35	17.49	12.95	10.12
6) Total tank storage capacity (MCM)	57.167	8.801	1.684	2.625	0.062	0.121	0.155	0.221	0.164	0.133
7) Effective storage capacity (MCM)	57.048	7.157	1.554	2.504	0.059	0.118	0.151	0.217	0.163	0.128
(3) Water Source										
1) During last 5 years , the tank spilled	Every Maha	Every Maha	1 year in Maha	Every Maha	3 years in Maha	Every Maha	3 years in Maha	4 years in Maha	3 years in Maha	4 years in Maha
2) During last 5 years , the tank dried up	No dry up	No dry up	No dry up	No dry up	3 years in Yala	3 years in Yala	No dry up	No dry up	No dry up	No dry up
(4) Facilities										
1) Tank										
1. Length of tank bund (m)	1,649	1,178	1,220	1,097	548	350	496	1,300	200	1,200
2. Top width of bund (m)	2.74	3.72	1.68	3.05	3.65	1.80	2.17	2.15	2.43	2.44
3. Top level of bund, EL. (m)	104.72	93.26	104.88	106.40	103.35	103.34	102.95	103.35	103.20	103.65
4. Bund upstream slope	2.50	2.00	2.00	1.50	1.50	1.50	2.00	1.50	1.50	1.50
5. Bund downstream slope	2.00	2.00	2.00	2.00	1.50	2.00	2.00	1.50	1.50	1.50
6. No. of sluice for irrigation	1	2	3	1	1	2	3	1	1	1
7. Location of sluice	LB	RB & CENTRE	LB, RB & CENTRE	RB END	LB	LB	LB & CENTRE	CENTRE	RB	RB
8. Sill level, Sluice 1, EL (m)	94.06	86.26	100.00	100.00	100.00	100.00	100.47	100.00	100.00	100.00
9. Sill level, Sluice 2, EL (m)		83.52	101.52			100.60	100.00			
10. Sill level, Sluice 3, EL (m)			101.52				100.78			
11. Design discharge, Sluice 1 (m3/s)	0.700	0.522	0.054	0.216	0.028	0.028	0.013	0.030	0.028	0.057
12. Design discharge, Sluice 2 (m3/s)	2.550	0.060	0.054			0.015	0.017			
13. Design discharge, Sluice 3 (m3/s)			N.A.				0.012			
14. No. of spillway	1	1	3	1	1	1	1	1	1	1

Table M.5.1 Present Condition of Irrigation Facilities for F/S Respective Schemes (2/2)

Name of scheme	Nachchaduwa	Palukadawela	Periyakulama	Mahananneriya	Kallanchiya	Arthikulama	Mailewa	Iharagama	Thambare	Nanneriya
(4) Facilities										
1) Tank										
15. Location of spillway	RB	LB END	LB & RB 2nos	LB END	RB	LB	RB	LB	RB	RB
16. Type of spillway	Lifting Gate	Masonry	Concrete & Natural	Concrete	Concrete	Concrete	Natural	Natural	Natural	Concrete
17. Crest Level of spillway, EL (m)	101.68	91.82	103.66	104.57	102.44	102.44	102.02	102.44	102.44	102.44
18. Design High Flood Level, EL (m)	102.34	92.65	104.27	105.64	102.59	102.74	102.17	102.74	102.67	102.70
19. Top level of bund, EL. (m)	104.72	93.26	104.88	106.40	103.35	103.34	102.95	103.35	103.20	103.65
20. Design Flood Discharge, (m ³ /s)	1,100		89							
21. Measuring device at the head of main canal	Yes	Yes	No	No	No	No	No	No	No	No
22. Type of measuring device	Staff gauge	Staff gauge								
2) Main Canal										
1. Numbers	2	2	1	1	1	2	3	1	2	2
2. Total length of LB (m)	28,180	3,280				399	453		728	840
3. Total length of Centre (m)							459			
4. Total length of RB (m)	11,891	16,500		3,560	603	323	419	1,142	342	706
3) D-Canal										
1. Numbers	26	23	1	0						
2. Total length of LB (m)	13,237		1,655							
3. Total length of RB (m)	7,595	17,583								
4) F-Canal										
1. Numbers	466	103	2	14						
2. Total length of LB (m)	74,863		2,046							
3. Total length of RB (m)	38,702	29,049	1,030	3,885						

Table M.5.2 List of Canals in Nachchaduwa Scheme

		Total Length (m)	nos
Main Canals	HL	28,180	1
	LL	11,891	1
	total	40,071	2
D-Canals	HL	13,237	16
	LL	7,595	10
	total	20,832	26
F-Canals	HL	74,863	256
	LL	38,702	210
	total	113,565	466

Note :

HL : High Level Main Canal

LL : Low Level Main Canal

Name of FO		D-canal		F-canal	
		nos	Total Length (m)	nos	Total Length (m)
Sena Samagi	HLD1	0	0	3	737
	HLD2	0	0	1	996
	HLD2A	0	0	1	786
	HLD3	0	0	6	1,566
	HLD4	1	801	8	1,310
	HLD4A	0	0	6	971
	HLD5	1	150	5	1,744
	HLD5A	0	0	2	160
	HLD6	0	0	9	2,840
Sub-total		2	951	41	11,110
Mahasen	HLD7	1	1,850	27	8,841
	HLD8	0	0	9	1,545
	HLD9	0	0	7	2,277
	HLD9A	0	0	8	2,274
Sub-total		1	1,850	51	14,937
Parakkurama	HLD10	0	0	5	1,749
	HLD11	1	295	9	2,254
	HLD12	1	582	13	2,705
Sub-total		2	877	27	6,708
Samagi	HLD13	0	0	3	882
	HLD14	0	0	2	571
	HLD15	1	92	8	1,687
	HLD16	0	0	3	1,145
	HLD17	0	0	3	878
Sub-total		1	92	19	5,163
Ranketa	HLD19	1	96	7	2,438
	HLD20	0	0	6	3,468
	HLD21	1	627	8	74
	HLD22	0	0	12	545
	HLD23	1	400	4	496
	HLD25	1	468	0	0
Sub-total		4	1,591	37	7,021
26/27 DC	HLD26	1	1,761	9	3,627
	HLD27	1	1,961	17	5,881
Sub-total		2	3,722	26	9,508
Ruwanweli	HLD28	0	0	2	784
	HLD29	0	0	6	2,555
	HLD30	0	0	2	629
	HLD31	0	0	3	1,000
	HLD32	0	0	2	382
	HLD33	0	0	3	453
	HLD34	0	0	2	782
	HLD35	1	1,712	13	3,634
Sub-total		1	1,712	33	10,219
Tissa	HLD36	2	1,692	9	6,147
	HLD37	1	750	3	725
	HLD38	0	0	3	1,250
	HLD39	0	0	7	2,075
Sub-total		3	2,442	22	10,197
High Level Canal Area		16	13,237	256	74,863

Name of FO		D-canal		F-canal	
		nos	Total Length (m)	nos	Total Length (m)
Al-Aksa	LLD1	1	820	13	4,304
	LLD1A	1	505	8	1,689
	LLD2	1	475	12	2,511
Sub-total		3	1800	33	8504
Eksath	LLD3	0	0	4	1,150
	LLD3A	0	0	2	975
	LLD3B	0	0	6	2,472
	LLD4	1	1,245	18	990
Sub-total		1	1245	30	5587
Isuru	LLD5	0	0	8	0
	LLD6	1	1,342	23	6,072
	LLD6A	0	0	6	1,350
Sub-total		1	1342	37	7422
Ranamayura	LLD6B	0	0	5	840
	LLD7	1	200	7	2,125
	LLD8	1	350	18	4,352
	LLD8A	0	0	1	188
	LLD8B	0	0	6	896
	LLD8C	0	0	5	1,198
	LLD8D	0	0	5	1,118
Sub-total		2	550	47	10717
Gemunu	LLD9	1	1,588	24	0
	LLD9A	0	0	2	122
	LLD10	1	335	6	35
	LLD10A	0	0	1	275
	LLD10B	0	0	3	150
	LLD10C	0	0	1	100
	LLD10D	0	0	3	650
	LLD10E	0	0	1	0
Sub-total		2	1923	41	1332
Wijaya	LLD11	1	735	17	3,235
	LLD11A	0	0	2	500
	NRB	0	0	1	375
	NCE	0	0	1	1,030
	NLB	0	0	1	0
Sub-total		1	735	22	5140
Low Level Canal Area		10	7,595	210	38,702

Table M.5.3 List of D-canals and F-canals in Palukadawela Scheme (1/3)

No.	Name of D-Canal	Name of Canal	Length (m)	
			D-Canal	F-Canal
1	Tract 1 - D1		90	
2	Tract 1 - D2		142	
3	Tract 1 - D6		1,430	
4		Tract 1 - D6 FC1		235
5		Tract 1 - D6 FC2		122
6		Tract 1 - D6 FC3		150
7	Tract 1 - D8		598	
8		Tract 1 - D8 FC1		550
9		Tract 1 - D8 FC2		326
10		Tract 1 - D8 FC3		273
11		Tract 1 - D8 FC4		180
12	Tract 2 - D9		360	
13	Tract 2 - D10		1,950	
14		Tract 2 - D10 FC1		92
15		Tract 2 - D10 FC2		220
16		Tract 2 - D10 FC3		268
17		Tract 2 - D10 FC5		175
18		Tract 2 - D10 FC6		195
19		Tract 2 - D10 FC7		480
20		Tract 2 - D10 FC8		469
21		Tract 2 - D10 FC9		288
22		Tract 2 - D10 FC10		279
23		Tract 2 - D10 FC11		593
24		Tract 2 - D10 FC12		841
25		Tract 2 - D10 FC13		343
26		Tract 2 - D10 FC14		93
27		Tract 2 - D10 FC15		492
28		Tract 2 - D10 FC16		171
29	Tract 2 - D10/4		1,915	
30		Tract 2 - D10/4 FC1		101
31		Tract 2 - D10/4 FC2		43
32		Tract 2 - D10/4 FC3		
33		Tract 2 - D10/4 FC4		24
34		Tract 2 - D10/4 FC5		120
35		Tract 2 - D10/4 FC6		434
36		Tract 2 - D10/4 FC7		788
37		Tract 2 - D10/4 FC8		582
38		Tract 2 - D10/4 FC9		1,355
39	Tract 3 - D11		605	
40	Tract 3 - D12		297	
41	Tract 3 - D13		368	
42	Tract 3 - D14		287	
43	Tract 3 - D15		314	
44	Tract 3 - D16		1,020	
45	Tract 3 - D17		975	
46	Tract 3 - D18		190	

Table M.5.3 List of D-canals and F-canals in Palukadawela Scheme (2/3)

No.	Name of D-Canal	Name of Canal	Length (m)	
			D-Canal	F-Canal
47	Tract 3 - D19		288	
48	Tract 3 - D21		110	
49	Tract 3 - D22		83	
50		Tract 4 - FC1		192
51		Tract 4 - FC2		138
52		Tract 4 - FC3		44
53		Tract 4 - FC4		94
54	Tract 4 - D1		720	
55		Tract 4 - D1 FC1		97
56		Tract 4 - D1 FC2		511
57		Tract 4 - D1 FC3		746
58		Tract 4 - D1 FC4		100
59		Tract 4 - D1 FC5		167
60	Welihiddewa Low Level Chl.		445	
61	Welihiddewa High Level Chl.		150	
62	Tract 4 - D2		166	
63		Tract 4 - D2 FC1		186
64		Tract 4 - D2 FC2		155
65		Tract 4 - D2 FC3		382
66		Tract 4 - D2 FC4		274
67		Tract 4 - D2 FC5		49
68		Tract 4 - D2 FC6		479
69		(Rambotakulama) FC7		357
70	Tract 5 - D1		1,712	
71		Tract 5 - D1 FC1		426
72		Tract 5 - D1 FC1/1		62
73		Tract 5 - D1 FC2		
74		Tract 5 - D1 FC1/2		286
75		Tract 5 - D1 FC3		244
76		Tract 5 - D1 FC3/1		64
77		Tract 5 - D1 FC3/2		87
78		Tract 5 - D1 FC4		170
79		Tract 5 - D1 FC5		362
80		Tract 5 - D1 FC5/1		240
81		Tract 5 - D1 FC5/2		221
82		Tract 5 - D1 FC5/3		65
83		Tract 5 - D1 FC6		308

Table M.5.3 List of D-canals and F-canals in Palukadawela Scheme (3/3)

No.	Name of D-Canal	Name of Canal	Length (m)	
			D-Canal	F-Canal
84	Tract 5 - D2		2,038	
85		Tract 5 - D2 FC1		427
86		Tract 5 - D2 FC1/1		85
87		Tract 5 - D2 FC2		244
88		Tract 5 - D2 FC2/1		518
89		Tract 5 - D2 FC3		104
90		Tract 5 - D2 FC4		22
91		Tract 5 - D2 FC17		1,500
92		Tract 5 - D2 FC17/1		61
93		Tract 5 - D2 FC17/2		95
94		Tract 5 - D2 FC17/3		300
95		Tract 5 - D2 FC17/4		330
96		Tract 5 - D2 FC16		392
97		Tract 5 - D2 FC16/1		73
98		Tract 5 - D2 FC16/2		46
99		Tract 5 - D2 FC16/3		98
100		Tract 5 - D2 FC16/4		86
101		Tract 5 - D2 FC16/5		55
102		Tract 5 - D2 FC16/6		91
103	Tract 6 - D1		1,925	
104		Tract 6 - D1 FC1		212
105		Tract 6 - D1 FC2		1,007
106		Tract 6 - D1 FC2/1		307
107		Tract 6 - D1 FC3		194
108		Tract 6 - D1 FC4		209
109		Tract 6 - D1 FC5		552
110		Tract 6 - D1 FC5/1		193
111		Tract 6 - D1 FC5/2		292
112		Tract 6 - D1 FC5/3		54
113		Tract 6 - D1 FC6		793
114		Tract 6 - D1 FC7		292
115		Tract 6 - D1 FC8		390
116		Tract 6 - D1 FC9		476
117		Tract 6 - D1 FC9/1		82
118		Tract 6 - D1 FC9/2		102
119		Tract 6 - D1 FC9/3		370
120		Tract 6 - D1 FC9/4		118
121		Tract 6 - D1 FC10		235
122		Tract 6 - D1 FC11		267
123		Tract 6 - D1 FC12		431
124		Tract 6 - D1 FC12/1		168
125		Tract 6 - D1 FC12/2		193
126		Tract 6 - D1 FC12/3		202
	Total		18,178	28,454

Table M.5.5 Present Condition of Water Management and O&M in Nachchaduwa Scheme (1/11)

Questionnaire for Irrigation and O&M	Nachchaduwa Scheme		
Name of FO	Isuru	Eksath	Alaksha
Names of D-canals under the FO	LLD-5, 6, 6A	LLD-3, 3A, 3B, and 4	LLD-1, 2, 1A
Extents of the paddy fields under the FO area	353 acres	360 acres	510 acres
Extents cultivated in last Yala	8 acres for OFC 345 acres for paddy	340 acres	510 acres
Extents cultivated in this Maha	353 acres	340 acres	510 acres
<u>Water Management</u>			
Nos. of Cultivator	120 persons	Over 150 persons	255 persons
Nos. of persons who attend the kanna meeting	20 persons in Maha	150 persons in Maha	25 persons in Maha
Do the farmers know the decision in the kanna meeting?	Yes	Yes	Yes
Have they seen the minutes of the meeting ?	No, no copy is kept by FO	No, copy is kept by FO	No, copy is kept by FO
Operation Rules of the off-takes on the main canal to divert water to D-canals Are all gates opened at the same time ? Or, are rotation conducted among D-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)	In the first month (40 days), the gate is kept open. Afterwards, 4 days closed and 5 days open If water shortage season, 5 days close and 5 days open	In the first month (40 days), the gate is kept open. Afterwards, 4 days closed and 5 days open	In the first month (40 days), the gate is kept open. Afterwards, 5 days closed and 5 days open
Operation Rules of the off-takes on the D canal to divert water to F-canals Are all gates opened at the same time ? Or, are rotation conducted among F-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)	It is impossible to conduct rotation irrigation due to defects of irrigation facilities.	Tail area is fed the first 3 days, and then head area is fed.	Tail area is fed first. The time for distribution is based on the extents of paddy lots. Head area is fed in the fifth day with 24 hours irrigation.
Who operates off-takes on the D- canal?	FO and FC representatives named by Yaya Representative.	FO and FC representatives named by Yaya Representative.	FO and FC representatives named by Yaya Representative.
In general, can the farmers can feed the water into their paddy field as per schedule decided by the kanna meeting ?	No	Yes, if sufficient water is available.	Yes

Table M.5.5 Present Condition of Water Management and O&M in Nachchaduwa Scheme (2/11)

Questionnaire for Irrigation and O&M	Nachchaduwa Scheme		
Name of FO	Isuru	Eksath	Alaksha
If not, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	Discussion with FO leader and members. After that, report to WS and RPM	Farmers – FC leader – FO – WS – RPM	FO request WS in writing FO – RPM – ID with discussion
Is there an irrigation water dispute between upstream and downstream of the D-Canal ?	Yes		
If any, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	FO discuss problems with the farmers to solve the problem within the D-canals In respect to the issues related to the main canal, FO report the problem to WS, RPM, and ID.	All problems are settled within FO. Yaya representative attend to solve the problem. However he has little experience for it, FO leader finally solves the problems. No issue has been report the RPM's office.	Discussion between FC representative and farmers. Report FO chairman for discussion Report to RPM for discussion
Maintenance			
Who maintain the D Canals? (Sramadana or Panggu ?)	Sramadama Tea and snack by FO	Sramadana Areas to be maintained are allocated to each FC The FC leaders are responsible for each maintenance	Sramadama Tea and snack by FO
Who maintain the Field Canals? (Sramadana or Panggu ?)	Panggu	Panggu	Panggu
Action against persons who do not attend the maintenance works (Penalty ? or another persons will do ?)	Most of all (98%) attend the maintenance works. A penalty of Rs. 50/6 feet should be imposed, no application has been made	Everyone attends the maintenance works under instruction of FO. Penalty Rs. 50/6 feet	For the persons who do not attend the maintenance works, FO tells him to do it. If he still do not follow the instruction, FO carries out the work as sramadana by other farmers Penalty Rs. 50/6 feet
Do the FO receive the cost allocation for the maintenance?	Yes,	Yes,	Yes,

Table M.5.5 Present Condition of Water Management and O&M in Nachchaduwa Scheme (3/11)

Questionnaire for Irrigation and O&M	Nachchaduwa Scheme		
Name of FO	Isuru	Eksath	Alaksha
If any, source of the budget (Irrigation department or any other agencies ?) with approximate amounts per year	Rs. 8,000 – Rs. 10,000	For maintenance fee (clearing) Rs. 3,500 for only LLD4 In addition Rs. 11,000 for maintenance is allocated. The cost is estimated by TA of ID. So, difficult to reflect the farmer's opinion for the works.	-
Usage of budget	Rehabilitation of turnout		Balance is used for function of community
Amount of Salaris (amount or volume per acre per season)	Salaris : Rs. 100 or 0.5B per acre/season FO collect the salaris 75% for FO leader 25% for deposit of FO account	Salaris : Rs. 100 or 0.5B per acre/season FO collect the salaris 75% for FO leader 25% for deposit of FO account	Salaris : Rs. 100 or 0.5B per acre/season
In the case the farmers bear the rehabilitation cost for the facilities, how much do they bear	No case	No case	No case All costs for the maintenance works are borne by FO

Table M.5.5 Present Condition of Water Management and O&M in Nachchaduwa Scheme (4/11)

Questionnaire for Irrigation and O&M	Nachchaduwa Scheme		
Name of FO	Wijaya	Gemunu	Rana Mayula
Names of D-canals under the FO	LD – NB2D	D-9, 10, 11	LLD 6,7,8
Extents of the paddy fields under the FO area	241 acres	426 acres	337 acres
Extents cultivated in last Yala	241 acres	400 acres	337 acres
Extents cultivated in this Maha	241 acres	412 acres	337 acres
<u>Water Management</u>			
Nos. of Cultivator Nos. of persons who attend the kanna meeting	56 persons Maha Kanna 20% 75% among FO members	248, among which 180 persons reside out of commanding area. Maha Kanna 150 persons 150-200 persons among FO members	102 Maha Kanna 50 persons Only FO leader attends the meeting among members.
Do the farmers know the decision in the kanna meeting? Have they seen the minutes of the meeting ?	Yes, No for ordinary farmers	Yes, No for ordinary farmers	Yes, No for ordinary farmers No copy is kept by FO
Operation Rules of the off-takes on the main canal to divert water to D-canals Are all gates opened at the same time ? Or, are rotation conducted among D-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)	Water distribution as per farmers' request because there is ample water in Nilbawa wewa.	4 days close and 6 days open for first 1 month. 6 days close and 4 days open for following period (2.5 months for Yala , and 3.5 months for Maha)	4 days close and 4 days open for first 1 month 6 days close and 4 days open for the following 2.5 month
Operation Rules of the off-takes on the D canal to divert water to F-canals Are all gates opened at the same time ? Or, are rotation conducted among F-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)	No rotation is required because there is ample water in Nilbawa wewa.	In principal, tail-first rotation method is adopted. Head-first rotation is applied if the upstream reach is not fed successfully in the previous rotation period.	In principal, tail-first rotation method is adopted. Water issue is monitored by the FO leader to adjust the water volume for each farm lot.
Who operates off-takes on the D- canal?	FO chairman	FO chairman, secretary as well as Yaya representative	LLD6-Secretary LLD7-Chairman LLD8-Farmer representative
Questionnaire for Irrigation and O&M	Nachchaduwa Scheme		

Table M.5.5 Present Condition of Water Management and O&M in Nachchaduwa Scheme (5/11)

Name of FO	Wijaya	Gemunu	Rana Mayula
In general, can the farmers can feed the water into their paddy field as per schedule decided by the kanna meeting ?	Yes	No Water is not sufficient.	Yes However, it takes time to check the gate condition and to make discussion with farmers because the regular maintenance is no so active among FO members.
If not, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	No such situation have come because there is enough water resources from both Nachchaduwa and Turuwila	First step : Meeting with WS and FO Second step : Report to RPM for discussion Third step : RPM prepares letter to ID in order to have a meeting Fourth step : FO meets the engineer of ID to settle the problem	First step : FO office bearers visit farmers concerned to have a discussion Second step : FO office bearers report to WS of ID and have a discussion. Third step : report to RPM Fourth step : report to ID
Is there an irrigation water dispute between upstream and downstream of the D-Canal ?	No	Yes, but minor problems only.	Yes
If any, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	N.A.	It is possible to settle them within FO members through mutual discussion.	Unless the instruction by the FO leader is made, uneven water distribution may occur (farmers having paddy field at the head of the canal take water first). At present, no problem takes place because the monitoring of water distribution is carries out by FO leader successfully.
<u>Maintenance</u>			
Who maintain the D Canals? (Sramadana or Panggu ?)	Sramadana without payment for the participants. Tea and snacks are served by FO	FO employs farmers	Sramadana without payment for the participants. Tea and snacks are served by FO
Who maintain the Field Canals? (Sramadana or Panggu ?)	Panggu	Panggu	Panggu

Table M.5.5 Present Condition of Water Management and O&M in Nachchaduwa Scheme (6/11)

Questionnaire for Irrigation and O&M	Nachchaduwa Scheme		
Name of FO	Wijaya	Gemunu	Rana Mayula
Action against persons who do not attend the maintenance works (Penalty ? or another persons will do ?)	90% of farmers participate in the sramadana Remaining 10% are requested to complete the work within further 10 days. If they do not, FO employ the person to maintain the canals and the required cost is asked to pay to persons who violate the rule. Penalty is Rs. 50 per 6 feet, but no collection has been made so far.	80% of farmers participate in the sramadana FO leaders and the farmers instruct the persons, who violate the rule, to do carry out the work. Penalty is Rs. 60 per 6 feet, but no collection has been made so far.	80% of farmers participate in the sramadana The persons, who violate the rule, are instructed to complete the work. If they do not, FO employ the person to maintain the canals and the required cost is asked to pay to the persons. Penalty is Rs. 50 per 6 feet, but no collection has been made so far.
Do the FO receive the cost allocation for the maintenance?	Yes,	Yes,	Yes
If any, source of the budget (Irrigation department or any other agencies ?) with approximate amounts per year	Some Rs. 4,000 per year	Rs. 18,500 for O&M in 1998	Rs. 4,100 per year Cost is estimated based on joint inspection of farmers and TA of ID. Final decision is made the TA because of budgetary restriction for the O&M cost.
Usage of budget	Desilting of canal and repair of turnouts	Repair of the D-canal by masonry.	Repair of the D-canal by masonry.
Amount of Salaris (amount or volume per acre per season)	Nobody pays salaris	Rs. 100 /acre/season 40% of farmers pay	0.5 B (Rs. 100) /acre/season 60% of farmers pay 65% of the salaris for FO leader 35% of the salaris for FO account.
In the case the farmers bear the rehabilitation cost for the facilities, how much do they bear	Yes, but rare case. Balance of cost allocation as well as commission of contract other than ID, such as road rehabilitation work, are saved for the rehabilitation.	No	No

Table M.5.5 Present Condition of Water Management and O&M in Nachchaduwa Scheme (7/11)

Questionnaire for Irrigation and O&M	Nachchaduwa Scheme		
<u>Name of FO</u>			
<u>Names of D-canals under the FO</u>	HLD 7	HLD 17	HLD 10,11,12
Extents of the paddy fields under the FO area	300 acres	52 acres	375 acres
Extents cultivated in last Yala	300 acres	52 acres	375 acres
Extents cultivated in this Maha	Unknown at the time	Unknown at the time	Unknown at the time
<u>Water Management</u>			
Nos. of Cultivator Nos. of persons who attend the kanna meeting	150 persons 20 persons	72 persons 10-15 persons Only farmers representatives are invited to the kanna meeting.	15 persons 125 persons
Do the farmers know the decision in the kanna meeting? Have they seen the minutes of the meeting ?	No No	Yes Yes	Yes Yes
Operation Rules of the off-takes on the main canal to divert water to D-canals Are all gates opened at the same time ? Or, are rotation conducted among D-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)	4 days close and 5 days open	3 days close and 5 days open	5 days close and 3 days open
Operation Rules of the off-takes on the D canal to divert water to F-canals Are all gates opened at the same time ? Or, are rotation conducted among F-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)	Rotational irrigation for each field canal area	No rotation is adopted. Off-take gates on D-canals are opened simultaneously until the paddy field are fed with 3 inches depth.	Head-first rotational system is adopted.
Who operates off-takes on the D- canal?	Jalapalaka from FO	Jalapalaka from FO	Jalapalaka from FO

Table M.5.5 Present Condition of Water Management and O&M in Nachchaduwa Scheme (8/11)

Questionnaire for Irrigation and O&M	Nachchaduwa Scheme		
<u>Name of FO</u>			
In general, can the farmers can feed the water into their paddy field as per schedule decided by the kanna meeting ?	Yes unless the canals are damaged.	Yes unless the canals are damaged.	Yes unless the canals are damaged.
If not, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	Farmers – Yaya representative – FO leader - IMD	Farmers – Yaya representative – FO leader - IMD	FC leader – FO - IMD
Is there an irrigation water dispute between upstream and downstream of the D-Canal ?	Yes	Yes	Yes
If any, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	Within FO members	Within FO members	Within FO members
<u>Maintenance</u>			
Who maintain the D Canals? (Sramadana or Panggu ?)	Panggu by farmers	Panggu by farmers	Panggu by farmers
Who maintain the Field Canals? (Sramadana or Panggu ?)	Panggu by farmers	Panggu by farmers	Panggu by farmers
Action against persons who do not attend the maintenance works (Penalty ? or another persons will do ?)	FO office bearers with FC Leader take action	No problem takes place so far.	FC Leader take action
Do the FO receive the cost allocation for the maintenance?	Yes	Yes	Yes
If any, source of the budget (Irrigation department or any other agencies ?) with approximate amounts per year	ID	ID	ID
<u>Usage of budget</u>			
Amount of Salaris (amount or volume per acre per season)	1/2 B per acre per season O&M account : Rs 45,000	1/2 B per acre per season O&M account : Rs. 20,000	1/2 B per acre per season O&M account : Rs. 30,000
In the case the farmers bear the rehabilitation cost for the facilities, how much do they bear			

Table M.5.5 Present Condition of Water Management and O&M in Nachchaduwa Scheme (9/11)

Questionnaire for Irrigation and O&M	Nachchaduwa Scheme			
Name of FO	26/27	Lanketha	Ruwanwadi	Tissa
Names of D-canals under the FO	HLD26,27	HLD19-25	HLD28-35	HLD36-39
Extents of the paddy fields under the FO area	440 acres	490 acres	496 acres	526 acres
Extents cultivated in last Yala	380 acres	490 acres	496 acres	526 acres
Extents cultivated in this Maha	-	50 acres	150 acres	-
<u>Water Management</u>				
Nos. of Cultivator Nos. of persons who attend the kanna meeting	222 persons 10-50 participants Only 30% of persons reside within the area	165 persons 20-25 persons	196 persons 25 persons	199 persons 7-8 persons
Do the farmers know the decision in the kanna meeting? Have they seen the minutes of the meeting ?	No Now, copy of the minutes is not kept	No Now, copy of the minutes is not kept	No Now, copy of the minutes is not kept	No Now, copy of the minutes is not kept
Operation Rules of the off-takes on the main canal to divert water to D-canals Are all gates opened at the same time ? Or, are rotation conducted among D-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)	6 days open and 4-5 days close operating the outlet of the Divwela Wewa	6 days open and 4-5 days close operating the outlet of the Divwela Wewa	6 days open and 4-5 days close operating the outlet of the Divwela Wewa	6 days open and 4-5 days close operating the outlet of the Divwela Wewa
Operation Rules of the off-takes on the D canal to divert water to F-canals Are all gates opened at the same time ? Or, are rotation conducted among F-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)	No rotation rule is adopted, periods for gate opening are according to lengths of the F-canals. 90% of FC structures are not functioned	No rotation rule is adopted, periods for gate opening are according to lengths of the F-canals. 90% of FC structures are not functioned	No rotation rule is adopted, periods for gate opening are according to lengths of the F-canals. 90% of FC structures are not functioned	No rotation rule is adopted, periods for gate opening are according to lengths of the F-canals. The tail-first rotation is adopted if water is not sufficient.
Who operates off-takes on the D- canal?	FC leader putting sand bags on the D-canals	FC leader putting sand bags on the D-canals	FC leader putting sand bags on the D-canals	FC leader putting sand bags on the D-canals
Questionnaire for Irrigation and O&M	Nachchaduwa Scheme			

Table M.5.5 Present Condition of Water Management and O&M in Nachchaduwa Scheme (10/11)

Name of FO	26/27	Lanketha	Ruwanwadi	Tissa
In general, can the farmers can feed the water into their paddy field as per schedule decided by the kanna meeting ?	No	No	No	No
If not, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	Discussion within FO Report to TA & IE Report to IMD	Discussion within FO Report to TA & IE Report to IMD	Discussion within FO Report to TA & IE Report to IMD	Discussion within FO Report to TA & IE Report to IMD
	Four FOs take action to solve the problems against the government agencies.			
Is there an irrigation water dispute between upstream and downstream of the D-Canal ?	No	No	No	No
If any, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	Mutual discussion within FO	Mutual discussion within FO	Mutual discussion within FO	Mutual discussion within FO
<u>Maintenance</u>				
Who maintain the D Canals? (Sramadana or Panggu ?)	Sramadama, paying allowance for participants, or Making contract with ID and having sramadana	Sramadama, paying allowance for participants, or Making contract with ID and having sramadana	Sramadama, paying allowance for participants, or Making contract with ID and having sramadana	Sramadama, paying allowance for participants, or Making contract with ID and having sramadana
Who maintain the Field Canals? (Sramadana or Panggu ?)	Panggu	Panggu	Panggu	Panggu
Action against persons who do not attend the maintenance works (Penalty ? or another persons will do ?)	FO employ labours. No penalties have been imposed.	FO employ labours. No penalties have been imposed.	FO employ labours. No penalties have been imposed.	FO employ labours. No penalties have been imposed.
Do the FO receive the cost allocation for the maintenance?	Yes, for maintenance of D-canals	Yes, for maintenance of D-canals	Yes, for maintenance of D-canals	Yes, for maintenance of D-canals
If any, source of the budget (Irrigation department or any other agencies ?) with approximate amounts per year				
Usage of budget	Repair of D-canal structures	Repair of D-canal structures	Repair of D-canal structures	Repair of D-canal structures

Table M.5.5 Present Condition of Water Management and O&M in Nachchaduwa Scheme (11/11)

Questionnaire for Irrigation and O&M	Nachchaduwa Scheme			
Name of FO	26/27	Lanketha	Ruwanwadi	Tissa
Amount of Salaris (amount or volume per acre per season)	Yes, Rs. 100 or 0.5 B /acre/ season	Yes, Rs. 100 or 0.5 B /acre/ season	Yes, Rs. 100 or 0.5 B /acre/ season	Yes, Rs. 100 or 0.5 B /acre/ season
In the case the farmers bear the rehabilitation cost for the facilities, how much do they bear	In case of F-canal, the farmers concerned bear the repair cost, paying some Rs. 1,000 per place	FO bear the repair cost for both D and F canals.	In case of F-canal, the farmers concerned bear the repair cost.	FO bear the repair cost for both D and F canals.

Table M.5.6 Present Condition of Water Management and O&M in Palukadawela Scheme (1/9)

Questionnaire for Irrigation and O&M	Palukadawela Scheme		
Name of FO	Yaya – 1	Yaya – 2	Yaya - 3
Names of D-canals under the FO	D-6	D-10/4, D-10	D-16
Extents of the paddy fields under the FO area	168 acres	415 acres	132 acres
Extents cultivated in last Yala	84 acres	207 acres	66 acres
Extents cultivated in this Maha	0 acre	0 acre	0 acre Mada kanna
<u>Water Management</u>			
Nos. of Cultivator Nos. of persons who attend the kanna meeting	116 persons 75% in Maha kanna	206 persons 60% in Maha kanna	87 persons
Do the farmers know the decision in the kanna meeting? Have they seen the minutes of the meeting ?	Yes Only FO leader have seen it.	Yes Only FO leader have seen it.	Yes Only FO leader have seen it.
Operation Rules of the tank sluice (Example. How many days the gate is open and the gate is closed)	In general, 6 days open and 8 days closed The water issue schedule is discussed on the water committee to adjust the schedule in accordance with weather condition.		
Operation Rules of the off-takes on the main canal to divert water to D-canals Are all gates opened at the same time ? Or, are rotation conducted among D-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)	6 days open and 8 days closed Operated by FO	6 days open and 8 days closed Operated by FO	6 days open and 8 days closed Operated by FO
Operation Rules of the off-takes on the D canal to divert water to F-canals Are all gates opened at the same time ? Or, are rotation conducted among F-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)	The period to open off-take gates on D canal is decided according to the extents fed by each F canal (within 6 days). Head-first rotation during land preparation period, and tail-first rotation during growing period.	The period to open off-take gates on D canal is decided according to the extents fed by each F canal (within 6 days).	The period to open off-take gates on D canal is decided according to the extents fed by each F canal (within 6 days).

Table M.5.6 Present Condition of Water Management and O&M in Palukadawela Scheme (2/9)

Questionnaire for Irrigation and O&M	Palukadawela Scheme		
Name of FO	Yaya – 1	Yaya – 2	Yaya - 3
Who operates off-takes on the D- canal?	FO (Chairman of water committee)	FO (Chairman of water committee)	FO (Chairman of water committee)
In general, can the farmers can feed the water into their paddy field as per schedule decided by the kanna meeting ?	It is on schedule if irrigation water is secured.	It is on schedule if irrigation water is secured.	It is on schedule if irrigation water is secured.
If not, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	Issue and problem are discussed at the Project Managing Committee. Case 1 : FO request to have the meeting. Case 2 : RPM calls up the meeting	Issue and problem are discussed at the Project Managing Committee. Case 1 : FO request to have the meeting. Case 2 : RPM calls up the meeting	Issue and problem are discussed at the Project Managing Committee. Case 1 : FO request to have the meeting. Case 2 : RPM calls up the meeting
Is there an irrigation water dispute between upstream and downstream of the D-Canal ?	Yes if water shortage comes.	Yes if water shortage comes.	Yes if water shortage comes.
If any, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	FO brings up the issues to the water management committee. The committee consists of 7 FO leaders, RPM, TA, WS, Irrigators, and IE Galgamuwa.	FO brings up the issues to the water management committee. The committee consists of 7 FO leaders, RPM, TA, WS, Irrigators, and IE Galgamuwa.	FO brings up the issues to the water management committee. The committee consists of 7 FO leaders, RPM, TA, WS, Irrigators, and IE Galgamuwa.

Table M.5.6 Present Condition of Water Management and O&M in Palukadawela Scheme (3/9)

Questionnaire for Irrigation and O&M	Palukadawela Scheme		
Name of FO	Yaya – 1	Yaya – 2	Yaya - 3
<u>Maintenance</u>			
Who maintain the D Canals? (Sramadana or Panggu ?)	Contract by ID	Sramadana	Sramadana
Who maintain the Field Canals? (Sramadana or Panggu ?)	Panggu	Panggu	Panggu
Action against persons who do not attend the maintenance works (Penalty ? or another persons will do ?)	Everybody attend the sramadana.	FO inform persons, who violate the rule, to conduct the maintenance works. Penalty is Rs. 100/6 feet was decided by the Kanna meeting.	FO inform persons, who violate the rule, to conduct the maintenance works. Penalty is Rs. 100/6 feet was decided by the Kanna meeting.
Do the FO receive the cost allocation for the maintenance?	Yes	Yes	Yes
If any, source of the budget (Irrigation department or any other agencies ?) with approximate amounts per year	Rs. 2,200 from ID	Rs. 8,500 from ID	Rs. 855 from ID
Usage of the fund	Contract for D-canal maintenance	Allowance for the sramadana	Allowance for the sramadana
Amount of Salaris (amount or volume per acre per season)	0.5 B /acre/season Rate of collection : 75% 75% of salaris is allocated to Yaya Niyojita 25% of salaris is allocated to FO	0.5 B /acre/season rate of collection 60-70%	0.5 B /acre/season
In the case the farmers bear the rehabilitation cost for the facilities, how much do they bear	No FO takes an action	No Usually, FO requests ID to repair the facilities including water inlet to the fields.	

Table M.5.6 Present Condition of Water Management and O&M in Palukadawela Scheme (4/9)

Questionnaire for Irrigation and O&M	Palukadawela Scheme		
Name of FO	Yaya – 4	Yaya – 5	Yaya - 6
Names of D-canals under the FO	D-1 (70 acres) D-2 (70 acres) FC-20 acres	D-1 (102 acre) D-2 (194 acre)	D-1
Extents of the paddy fields under the FO area	160 acres	296 acres	128 acres
Extents cultivated in last Yala	0	0	0
Extents cultivated in this Maha	0	0	0
<u>Water Management</u>			
Nos. of Cultivator Nos. of persons who attend the kanna meeting	80 persons 30 persons in Maha kanna	196 persons 70 persons in Maha kanna	117 persons 40-50 persons in Maha kanna
Do the farmers know the decision in the kanna meeting? Have they seen the minutes of the meeting ?	Yes Only FO leaders have read it.		
Operation Rules of the tank sluice (Example. How many days the gate is open and the gate is closed)	In general, 6 days open and 5 days closed		
Operation Rules of the off-takes on the main canal to divert water to D-canals Are all gates opened at the same time ? Or, are rotation conducted among D-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)			
Operation Rules of the off-takes on the D canal to divert water to F-canals Are all gates opened at the same time ? Or, are rotation conducted among F-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)	Yes Tail-first rotation is adopted. The interval of rotation is flexible.		

Table M.5.6 Present Condition of Water Management and O&M in Palukadawela Scheme (5/9)

Questionnaire for Irrigation and O&M		Palukadawela Scheme		
<u>Name of FO</u>		Yaya – 4	Yaya – 5	Yaya - 6
Who operates off-takes on the D- canal?		FO office bearers, such as Chairman, and Secretary, operate the gates.		
In general, can the farmers can feed the water into their paddy field as per schedule decided by the kanna meeting ?		Yes if enough water is secured to the paddy fields.		
If not, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)		First step : Farmers and FO office bearers hold a meeting. Second step : If necessary, FO report to RPM to solve the problems. Third step : Issues are forwarded to ID		
Is there an irrigation water dispute between upstream and downstream of the D-Canal ?		Yes in case of water shortage	Yes in case of water shortage	Yes in case of water shortage
If any, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)		First step : Farmer have a meeting Second step : FO Third step : Report to ID		
Questionnaire for Irrigation and O&M		Palukadawela Scheme		
<u>Name of FO</u>		Yaya – 4	Yaya – 5	Yaya - 6

Table M.5.6 Present Condition of Water Management and O&M in Palukadawela Scheme (6/9)

Maintenance			
Who maintain the D Canals? (Sramadana or Panggu ?)	Employment of labours Allowance : Rs. 175 /person/day	Sramadana	Employment of labours Allowance : Rs. 175 /person/day
Who maintain the Field Canals? (Sramadana or Panggu ?)	Panggu	Panggu	Panggu
Action against persons who do not attend the maintenance works (Penalty ? or another persons will do ?)	Most of the farmers attend the maintenance works. Persons, who violate the rule, are instructed by the FO leader to conduct the work. No penalty is imposed so far.		
	Penalty : Rs. 40/6 feet	Penalty : Rs. 50/6 feet	Penalty : Rs. 50/6 feet
Do the FO receive the cost allocation for the maintenance?	Yes	Yes	Yes
If any, source of the budget (Irrigation department or any other agencies ?) with approximate amounts per year	ID	ID	ID
Usage of the fund	Rs. 2,000 for clearing Rs. 7,500 for desilting	Rs. 1,030 for clearing Rs. 12,300 for desilting	Rs. 3,700 for clearing Rs. 4,830 for desilting
Amount of Salaris (amount or volume per acre per season)	0.5 Bushel/acre/season 5% of salaris is deposit for FO	0.5 Bushel/acre/season 5% of salaris is deposit for FO	1 Bushel/acre/season 5% of salaris is deposit for FO
In the case the farmers bear the rehabilitation cost for the facilities, how much do they bear	No, FO bears the repair cost	No, FO bears the repair cost	No, FO bears the repair cost

Table M.5.6 Present Condition of Water Management and O&M in Palukadawela Scheme (7/9)

Questionnaire for Irrigation and O&M	Palukadawela Scheme	
<u>Name of FO</u>	Puranagama Walagamba FO	
<u>Names of D-canals under the FO</u>	Purana Canal	
Extents of the paddy fields under the FO area	403 acres	
Extents cultivated in last Yala	200 acres (bethma)	
Extents cultivated in this Maha	403 acres	
<u>Water Management</u>		
Nos. of Cultivator Nos. of persons who attend the kanna meeting	145 persons 50 persons attend the meeting	
Do the farmers know the decision in the kanna meeting? Have they seen the minutes of the meeting ?	Yes Only FO office bearers have seen the mimutes. Copy is kept by FO	
Operation Rules of the tank sluice (Example. How many days the gate is open and the gate is closed)	The sluice gate is kept open for one-month land preparation period Then, 4 days opened and 5 days closed for the following 2 months.	
Operation Rules of the off-takes on the main canal to divert water to D-canals Are all gates opened at the same time ? Or, are rotation conducted among D-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)	In stead of the off-take gates, 17 amuna (small diversion structure), consisting 15 concrete amuna and 2 earth amuna, are provided along the main channel. The irrigation water is distributed through the amuna so that the paddy field with an extents of 403 acre can be fed for 4 days. The diverted water is adjusted by use of planks at the amunas.	

Table M.5.6 Present Condition of Water Management and O&M in Palukadawela Scheme (8/9)

Operation Rules of the off-takes on the D canal to divert water to F-canals Are all gates opened at the same time ? Or, are rotation conducted among F-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)	No rule is specified	
Who operates off-takes on the D- canal?	Yaya Nyojitha are responsible for water distribution at the amuna,	
In general, can the farmers can feed the water into their paddy field as per schedule decided by the kanna meeting ?	Yes	
If not, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	Step 1 : Discussion at FO committee, consisting of FC eprepresentatives. Step 2 : Discussion at the Project Management Committee	
Is there an irrigation water dispute between upstream and downstream of the D-Canal ?	No	
If any, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	Not applicable.	
<u>Maintenance</u>		
Who maintain the D Canals? (Sramadana or Panggu ?)	Amuna is maintained by the farmers.	

Table M.5.6 Present Condition of Water Management and O&M in Palukadawela Scheme (9/9)

Who maintain the Field Canals? (Sramadana or Panggu ?)	Panggu	
Action against persons who do not attend the maintenance works (Penalty ? or another persons will do ?)	No problem takes place as everybody attends the maintenance works.	
Do the FO receive the cost allocation for the maintenance?	No, because ID do not regard the channels as D-canals.	
If any, source of the budget (Irrigation department or any other agencies ?) with approximate amounts per year	Not applicable	
Usage of the fund	Not applicable	
Amount of Salaris (amount or volume per acre per season)	No The Yaya Nyojita take turns at Two-year shifts so that everybody experiences O&M works.	
In the case the farmers bear the rehabilitation cost for the facilities, how much do they bear	Yes, Share of expense is decided according to the cultivation extents of the FO members..	

Table M.5.7 Present Condition of Water Management and O&M in Periyakulama Scheme (1/3)

Questionnaire for Irrigation and O&M	Periyakulama Scheme
<u>Water Management</u>	
Nos. of Cultivator Nos. of persons who attend the kanna meeting	Nearly 40% of the cultivators participate in the meeting. Women do not participate even though they wish.
Do the farmers know the decision in the kanna meeting? Have they seen the minutes of the meeting ?	Yes. In general, the minutes is not opened to the public.
Extents of the paddy fields under the scheme	
Extents of Pranawela ?	
Estents of Akkarawela ?	
Extents cultivated in last Yala	
Extents cultivated in this Maha	
Do the farmer know the schedule of the tank sluice operation?	Yes
If yes, ask the schedule (Example. How many days the gate is open and the gate is closed)	
Who operates the tank sluice?	Vel Vidane
Who operates off-takes on the main canal?	Not applicable
Operation Rules of the off-takes on the main canal to divert water to F-canals Are all gates opened at the same time ? Or, are rotation conducted among F-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)	Not applicable
Is the water issue rotation within the F-canal conducted ?	
In general, can the farmers can feed the water into their paddy field as per schedule decided by the kanna meeting ?	

Table M.5.7 Present Condition of Water Management and O&M in Periyakulama Scheme (2/3)

Questionnaire for Irrigation and O&M	Periyakulama Scheme
If not, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	The FO leader, Vel Vidane, and farmers meet to solve the water conflict. The rotation method to be applied is decided.
Is there an irrigation water dispute between upstream and downstream of the Main Canal ?	Not applicable
If any, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	Not applicable
Is there an irrigation water dispute between upstream and downstream of the Field Canal ?	Not applicable
If any, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	Not applicable
<u>Maintenance</u>	
Do the farmers conduct the maintenance work as per decision of the kanna meeting?	Yes
Who maintain the tank? (Clearing of bund, maintenance of sluice)	ID
Who maintain the Main Canal? (Sramadana or Panggu ?)	Farmers by Panggu
Who maintain the Field Canals? (Sramadana or Panggu ?)	Not applicable
Action against persons who do not attend the maintenance works (Penalty ? or another persons will do ?)	The FO leader visit the person, who violate the rule, to make them to attend the works. If they do not the FO's instruction, FO carried out the work and penalty is imposed from the violator.
Do the FO receive the cost allocation for the maintenance? If any, source of the budget (Irrigation department or any other agencies ?) with approximate amounts per year	Contract basis for clearing of the tank bund. Some Rs. 17,000 is allocated to FO for the maintenance work.

Table M.5.7 Present Condition of Water Management and O&M in Periyakulama Scheme (3/3)

Questionnaire for Irrigation and O&M	Periyakulama Scheme
Describe the works by use of the allocated budget	
Amount of Salaris (amount or volume per acre per season)	Not collected
In the case the farmers bear the rehabilitation cost for the facilities, how much do they bear	

Table M.5.8 Present Condition of Water Management and O&M in Mahananneriya Scheme (1/3)

Questionnaire for Irrigation and O&M	Maha Nanneriya Scheme
<u>Water Management</u>	
Nos. of Cultivator	265 persons
Nos. of persons who attend the kanna meeting	125 persons attend the meeting.
Do the farmers know the decision in the kanna meeting? Have they seen the minutes of the meeting ?	Yes, Only FO leader has seen it
Extents of the paddy fields under the scheme	390 acres
Extents of Pranawela ?	297 acres
Extents of Akkarawela ?	93 acres
Extents cultivated in last Yala	23 acres in akkarawela
Extents cultivated in this Maha	None due to insufficient water
Do the farmer know the schedule of the tank sluice operation?	Yes
If yes, ask the schedule (Example. How many days the gate is open and the gate is closed)	7 days open and 7 days closed
Who operates the tank sluice?	Secretary of the FO
Who operates off-takes on the main canal?	Yaya representative
Operation Rules of the off-takes on the main canal to divert water to F-canals Are all gates opened at the same time ? Or, are rotation conducted among F-canal areas? If the rotation is conducted, please ask rules (Example. How many days each gate is open and the gate is closed)	Off-take gates are opened for 7 days and closed for 5 days
Is the water issue rotation within the F-canal conducted ?	No
In general, can the farmers can feed the water into their paddy field as per schedule decided by the kanna meeting ?	No

Table M.5.8 Present Condition of Water Management and O&M in Mahananneriya Scheme (2/3)

Questionnaire for Irrigation and O&M	Maha Nanneriya Scheme
If not, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	First step : Mutual discussion between farmers Second step : Mediation by FO to settle the problem Third step : If necessary, the FO leader take the action for even water distribution.
Is there an irrigation water dispute between upstream and downstream of the Main Canal ?	Yes
If any, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	Discussion between the FO leader and the farmers are carried out to settle the disputes.
Is there an irrigation water dispute between upstream and downstream of the Field Canal ?	Yes
If any, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	First step : A Yaya representative take the action to settle the disputes. Second step : The FO leader takes the action
<u>Maintenance</u>	
Do the farmers conduct the maintenance work as per decision of the kanna meeting?	Yes
Who maintain the tank? (Clearing of bund, maintenance of sluice)	The tank is maintained by ID Clearing of the sluice and tank bed are carried out by FO
Who maintain the Main Canal? (Sramadana or Pangu ?)	Sramadana without allowance
Who maintain the Field Canals? (Sramadana or Pangu ?)	Pangu
Action against persons who do not attend the maintenance works (Penalty ? or another persons will do ?)	Yes The fine is imposed for persons, who violate the rule.
Do the FO receive the cost allocation for the maintenance? If any, source of the budget (Irrigation department or any other agencies ?) with approximate amounts per year	Yes

Table M.5.8 Present Condition of Water Management and O&M in Mahananneriya Scheme (3/3)

Questionnaire for Irrigation and O&M	Maha Nanneriya Scheme
Describe the works by use of the allocated budget	
Amount of Salaris (amount or volume per acre per season)	Salaris Rs. 50 or 0.5 bushel /acre / season
In the case the farmers bear the rehabilitation cost for the facilities, how much do they bear	Not collected

Table M.5.9 Present Condition of Water Management and O&M in Mahananneriya Minor Schemes (1/5)

Questionnaire for Irrigation and O&M	Maha Nanneriya Minor Schemes		
	Kallanchiya	Palmailewa	Arthikulama
<u>Water Management</u>			
Nos. of Cultivator	65% of farmers participated	45 persons	35 persons
Nos. of persons who attend the kanna meeting		30 persons participated	65 persons participated
Do the farmers know the decision in the kanna meeting? Have they seen the minutes of the meeting ?	Yes	Yes	Yes
Extents of the paddy fields under the scheme	65 acres	45 acres	40 acres
Extents of Pranawela ?	35 acres	20 acres	35 acres
Extents of Akkarawela ?	30 acres	25 acres	5 acres
Extents cultivated in last Yala	None	None	None
Extents cultivated in this Maha	50 acres	40 acres	35 acres
Do the farmer know the schedule of the tank sluice operation?	Yes	Yes	Yes
If yes, ask the schedule (Example. How many days the gate is open and the gate is closed)	Initially, the sluice gate is opened for 5 days in the land preparation period. Afterwards, water distribution schedule is decided throughout mutual discussion according to needs	Land preparation is carried out by use of rainfall. The gates are open for 1 day with a 15-days interval if no rain is recorder for 15 days.	Water distribution schedule is decided throughout the discussion according to needs.
Who operates the tank sluice?	Vel Vidane	FO Jalapalaka (Vidane)	Vidane selected in the kanna meeting
Operation Rules to divert water to Farm lot Are all inlets opened at the same time ? Or, are rotation conducted among areas? If the rotation is conducted, please ask rules	The commanding area is divided into 3 sub-area. In a interval of 3 days, each sub-area is fed.	3 Sluice are open at the sama time for 1 day	Areas under the high level canal and the low level canal are fed in a interval of 3 days. Each area is divided into 3 sub-area. In a interval of 3 days, each sub-area is fed.
In general, can the farmers can feed the water into their paddy field as per schedule decided by the kanna meeting ?	Yes	Yes	Yes

Table M.5.9 Present Condition of Water Management and O&M in Mahananneriya Minor Schemes (2/5)

Questionnaire for Irrigation and O&M	Maha Nanneriya Minor Schemes		
	Kallanchiya	Palmailewa	Arthikulama
If not, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	There is no room to discuss action to be taken in case of serious water shortage as the water source is very critical even in the normal season.		
Is there an irrigation water dispute between upstream and downstream of the Main Canal ?	Due to the technical difficulties of the irrigation structure, uneven water distribution takes place among the commanding area.		
If any, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	Tail-first irrigation is adopted to ensure the even water distribution.		
<u>Maintenance</u>			
Do the farmers conduct the maintenance work as per decision of the kanna meeting?	Yes	Yes	Yes
Who maintain the tank? (Clearing of bund, maintenance of sluice)	The Vel Vidane instruct the farmers to conduct the maintenance works. He also inform the date of maintenance. The place to be maintained are allocated to each farmer according to the extent of his farm.		
Who maintain the Main Canal? (Sramadana or Pangu ?)	Pangu	Pangu	Pangu
Action against persons who do not attend the maintenance works (Penalty ? or another persons will do ?)	Fine : Rs. 50	Fine : Rs. 25	Fine : Rs. 25
	The fine has never been applied so far.		
Do the FO receive the cost allocation for the maintenance? If any, source of the budget (Irrigation department or any other agencies ?) with approximate amounts per year	No	No	No
Describe the works by use of the allocated budget	Not applicable	Not applicable	Not applicable
Amount of Salaries (amount or volume per acre per season)	1 Bushel per acre per season	1/2 Bushel per acre per season	1/2 Bushel per acre per season for the first time in 25 years
In the case the farmers bear the rehabilitation cost for the facilities, how much do they bear	No answer	No answer	No answer

Table M.5.9 Present Condition of Water Management and O&M in Mahananneriya Minor Schemes (3/5)

Questionnaire for Irrigation and O&M	Maha Nanneriya Minor Schemes		
	Ihalagama	Thambare	Ihala Nanneriya
<u>Water Management</u>			
Nos. of Cultivator	45 persons	50 persons	63 persons
Nos. of persons who attend the kanna meeting	30 persons participated	20 persons participated	30 persons participated
Do the farmers know the decision in the kanna meeting? Have they seen the minutes of the meeting ?	Yes The participants sign the minutes. The contents of the minutes are delivered to the absentees.	Yes	Yes
Extents of the paddy fields under the scheme	70 acres	105 acres	70 acres
Extents of Pranawela ?	40 acres	85 acres	35 acres
Estents of Akkarawela ?	30 acres	20 acres	35 acres
Extents cultivated in last Yala	14 acres but failed to harvest due to draught	0 Only OFC is cultivated with extents of 7 acres.	35 acres cultivated but nealy half failed due to draught
Extents cultivated in this Maha	70 acres	105 acres	70 acres
Do the farmer know the schedule of the tank sluice operation?	Yes	Yes	Yes
If yes, ask the schedule (Example. How many days the gate is open and the gate is closed)	Land preparation is carried out utilising the rainfall. Afterwards, the sluice gate is operated taking into account rainfall. Water distribution schedule is decided by the Vel Vidane selected at the kanna meeting.	Gate is operated taking into account rainfall. Water distribution schedule is decided, persons concerned getting together.	Gate is operated taking into account rainfall. Water distribution schedule is decided by the Vel Vidane or consensus of the farmers.
Who operates the tank sluice?	Vel Vidane	Vel Vidane	Vel Vidane
Operation Rules to divert water to Farm lot Are all inlets opened at the same time ? Or, are rotation conducted among areas? If the rotation is conducted, please ask rules	Puranawela : 2-day continuous irrigation with tai-first irrigation methods among 15-days. Akkarawela : continuous irrigation from amuna	Fill the first amuna for 4 days, the second amuna for 1 day. And then, the sluice is closed 5 days.	10 days closed and 8 days open 5 days on the right area, and 3 days on the left area

Table M.5.9 Present Condition of Water Management and O&M in Mahananneriya Minor Schemes (4/5)

Questionnaire for Irrigation and O&M	Maha Nanneriya Minor Schemes		
	Ihalagama	Thambare	Ihala Nanneriya
In general, can the farmers can feed the water into their paddy field as per schedule decided by the kanna meeting ?	Yes, storing rainfall into the reservoirs to the maximum extent.		
If not, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	The farmers inform the Vel Vidane to hold a meeting to solve the problem.		
Is there an irrigation water dispute between upstream and downstream of the Main Canal ?	Yes, in the case that sufficient irrigation water is not secured.		
If any, how is the problem is discussed. (Process of the mutual discussion and how contact to the government agency)	Mutual discussion with the farmers Representative farmers get together to solve the problem If not resolved, the issues are forwarded to the G/N for mediation.		
<u>Maintenance</u>			
Do the farmers conduct the maintenance work as per decision of the kanna meeting?	Yes	Yes	Yes
Who maintain the tank? (Clearing of bund, maintenance of sluice)	Persons who get the Samurdhi funds, that is Rs. 250 per month	Maintenance works is conducted under the Samurdhi Programme	Maintenance works is conducted under the Samurdhi Programme
Who maintain the Main Canal? (Sramadana or Pangu ?)	Pangu According to land holding size of the farmers.	Pangu According to land holding size of the farmers.	Pangu According to land holding size of the farmers.
Action against persons who do not attend the maintenance works (Penalty ? or another persons will do ?)	Fine : Rs. 25 per 6 feet Everybody attends the works	Fine : Rs. 25 per 6 feet Everybody attends the works	Fine : Rs. 25 per 6 feet Everybody attends the works
Do the FO receive the cost allocation for the maintenance? If any, source of the budget (Irrigation department or any other agencies ?) with approximate amounts per year	No	No except Samurdhi fund	No except Samurdhi fund

Table M.5.9 Present Condition of Water Management and O&M in Mahananneriya Minor Schemes (5/5)

Questionnaire for Irrigation and O&M	Maha Nanneriya Minor Schemes		
	Ihalagama	Thambare	Ihala Nanneriya
Describe the works by use of the allocated budget			
Amount of Salaris (amount or volume per acre per season)	0.5 bushel pre acre per season Only 50% of the persons pay the salaris	0.5 bushel pre acre per season Almost all of the farmers do not pay the salaris	0.5 bushel pre acre per season Almost all of the farmers do not pay the salaris
In the case the farmers bear the rehabilitation cost for the facilities, how much do they bear	In case of flood in 1993, The repair cost of Rs. 3,500 was collected from the farmers.	Th FO funds are spent for the repair works. In other case, a contract of WFP or sramadana.	The Samurdhi funds are utilised. The farmer have never paid for the repair works.

Table M.5.10 O&M Cost in Nachchaduwa and Periyakulama Schemes

Year	No.	Scheme	70% Head Work/ Others (Rs.Cts)	30% D Chls. & F.CC. (Rs.Cts)	Total Operation Cost (Rs.Cts)	Maintenance Cost (Rs.Cts)	Total O & M (Rs.Cts)
1995		Nachchaduwa	179,182.50	76,792.50	255,975.00	485,419.00	741,394.00
1996		Nachchaduwa	231,140.00	99,060.00	330,200.00	451,000.00	781,200.00
1997		Nachchaduwa	224,297.50	96,127.50	320,425.00	575,400.00	895,825.00
1998		Nachchaduwa	322,000.00	138,000.00	460,000.00	600,000.00	1,060,000.00
1999		Nachchaduwa	252,000.00	108,000.00	360,000.00	460,000.00	820,000.00
1995		Periyakulama			8,335.00	15,665.00	24,000.00
1996		Periyakulama			10,500.00	17,900.00	28,400.00
1997		Periyakulama			17,300.00	18,400.00	35,700.00
1998		Periyakulama			10,800.00	18,400.00	29,200.00
1999		Periyakulama			12,000.00	30,000.00	42,000.00

Table M.5.11 O&M Cost in Palukadawela and Mahanannneriya Schemes

Year	Scheme	Operation Cost of Range Office (Rs.Cts)	Operation Cost of Divisional Office (Rs.Cts)	Total Operation Cost (Rs.Cts)	Maintenance Cost (Rs.Cts)	Total O & M (Rs.Cts)
1999	Palukadawela	28,900.00	71,000.00	99,900.00	192,000.00	291,900.00
1998	Palukadawela	32,600.00	70,000.00	102,600.00	139,200.00	241,800.00
1997	Palukadawela	27,200.00	59,800.00	87,000.00	123,000.00	210,000.00
1996	Palukadawela	29,000.00	60,000.00	89,000.00	115,300.00	204,300.00
1995	Palukadawela	35,800.00	50,000.00	85,800.00	100,000.00	185,800.00
1999	Maha Nanneriya	5,600.00	14,000.00	19,600.00	37,400.00	57,000.00
1998	Maha Nanneriya	6,300.00	15,200.00	21,500.00	30,200.00	51,700.00
1997	Maha Nanneriya	5,200.00	15,300.00	20,500.00	29,800.00	50,300.00
1996	Maha Nanneriya	5,600.00	15,000.00	20,600.00	30,000.00	50,600.00
1995	Maha Nanneriya	6,900.00	11,600.00	18,500.00	22,900.00	41,400.00

Table M.5.4 List of D-canal & F-Canal in Maha Nannneriya Scheme

No.	Name of D-Canal	Name of F-Canal	Length (m)
1		FC1	600
2		FC2	243
3		FC3	168
4		FC4	228
5		FC5	342
6		FC6	108
7		FC7	72
8		FC8	408
9		FC9	281
10		FC10	248
11		FC11	252
12		FC12	321
13		FC13	341
14		FC14	273
	Total		3885

Table M 10.1 Deployment of Agricultural Extension Staffs in the Project Areas

Command				Deployment of Agricultural Extension Staffs								
				Agricultural Instructor (AI)						ADPA / FA		
				Code	Service Areas	Target Area in Scheme	No. of FOs in Target Areas	Experiences		ADPA (No.)	FA (No.)	Total (No.)
as Extension Staff	in Target Area											
Nachchaduwa	2,540	Nachchaduwa	AS Center Swarstipura	AI Nach-1	GN Hidogama	HLD 12-19	2 FOs	1.5 years	1.5 years	5	8	13
			(Service area/AI 1,580ha)	AI Nach-2	5 GN div.	HLD 2-7	2 FOs	1. 3 years	3 months			
				AI Nach-3	3 GN div.	HLD 9-11	5 FOs	1.5 years	1.5 years			
				AI Nach-4	5 GN div.	HLD 1-12/LLD 1-8	5 FOs	18 years	4 years			
Palukadawela	956	Galgamuwa	Galgamuwa	AI Gal-1	9 GN div.	Tract 1 - 5	6 FOs	13 years	7 years		7	7
			(Service area/AI 2,970ha)	AI Gal-2	9 GN div.	Tract-4 & 5	2 FOs	20 years	20 years			
			Mahananneriya	AI Maha-1	7 GN div.	Tract-6	1 FO	5 years	5 years			
Periyakulama	91	Tirappane	Tirappane (Service area/AI 3,4900ha)	AI Tira-1	13 GN div.	whole scheme	1 FO	5 years	1 year	1		1
Mahananneriya	158	Galgamuwa	Mahananneriya (Service area/AI 3,270ha)	AI Maha-2	8 GN div.	whole scheme	1 FO	16 years	5 years		1	1
Cascade VII	117											
- Kallanchiya	8	Galgamuwa	Galgamuwa	AI Gal-3	10 GN div.	whole scheme	1 FO	16 years	5 years		1	1
- Attikulama	12	Galgamuwa	Galgamuwa	AI Gal-2	9 GN div.	whole scheme	1 FO	20 years	20 years	}	1	}
- Ihalagama	22	Galgamuwa	Mahananneriya	} AI Maha-1 }	7 GN div.	whole scheme	1 FO	}	5 years			
- Tambarewewa	29	Galgamuwa	Mahananneriya			whole scheme	1 FO		}	1	}	
- Palu-Mailawew	20	Galgamuwa	Mahananneriya			whole scheme	1 FO					
- Ihalananneriya	26	Galgamuwa	Mahananneriya			whole scheme	1 FO					

Note: Service area/AI: Total farmland (ha) in the service area of AS center/No. of AIs posted in the Center

Table M 10.2 Deployment of Farmer Animator/Agricultural Development & Productivity Assistant in the Project Areas

Scheme	Deployed in		Farmer Animator (FA) / Agricultural Development & Productivity Assistant (ADPA)												
	DS Division	AS Center Service Area	Code	Status	Age	Sex	Education Career	Service Areas (GN Division)	Service Areas in Scheme	Target FO in Scheme	Experiences as FA/ADPA	Home GN Division	FA Induction Training Course Participated	Other Training Received	Means of Field Visit
Nachchaduwa	Nachchaduwa	Swarstipura	FA-S1	ADPA	32	F	A Level	264 Diwulwewa	HLD 19 & 21	2 FOs	5 years	GN 264	3 months at PDOA	-	Bicycle
			FA-S2	ADPA	24	M	A Level	271 Hidogama	HLD 7	FO Mahasem	4 years	GN 271	3 months at PDOA	Irri. management/IPM	Bicycle
			FA-S3	FA	27	M	A Level	265 K. Nelumbewa	HLD 26 & 27	FO D Canal	2 years	GN 265	1 month by AI	Water management	Bicycle
			FA-S4	ADPA	27	F	O Level	260 Swarstipura W.	HLD 30	Minor tank FO	3 years	GN 260	At Agr. School & PDOA	Water management	On foot
			FA-S5	FA	28	F	O Level	263 Amane	HLD 26	2 FOs	3 years	GN 263	3 months at PDOA	Irri. Manag./O&M	Bicycle
			FA-S6					269 Pahalawewa		2 FOs					
			FA-S7	FA	25	F	O Level	266 M. Nelumbewa		2 FOs	3 years	GN 266	3 months at PDOA	PRDP workshop	Bicycle
			FA-S8	FA	30	M	A Level	274 Kaluwila N.		FO Issuru	2 years	GN 274	3 months at PDOA		On foot
			FA-S9	ADPA	24	M	A Level	273 Madawalagama		FO Eksath	3 years	GN 273	3 months at PDOA		Bicycle
			FA-S10	ADPA	27	M	O Level	267 Pawakkulama		FO Ranamaura	3 years	GN 267	3 months at PDOA	In-service training	Motorcycle
			FA-S11	FA	27	F	O Level	535 Nachchaduwa		FO Alaksa	5 years	GN 535	3 months at PDOA		Bicycle
			FA-S12	FA	27	M	O Level	272 Suhadagama		FO Senasamagi	3 years	GN 272	3 months at PDOA	IPM, crops	Bicycle
			FA-S13	FA				268 Kaluarachchiyagama		FO Palakulama					
Palukadawela	Galgamuwa	Galgamuwa	FA-G1	FA	37	F	O Level	70 Kattakaduwa	Tract 1	FO Tract 1	4 years	Dewagiripura	3 months at Agr. School	Animal health	On foot
			FA-G2	FA	40	F	O Level	71 Wadugama	Tract 2	FO Tract 2	4 years	Dewagiripura	3 months at Agr. School	Animal health	Bicycle
			FA-G3	FA	24	M	O Level	GN 68 & 72	Tract 3	2 FOs	3 years	GN 72	3 months by AI at ASC	Workshop, DAS	Motorcycle
			FA-G4	FA	40	F	O Level	73 Palukadawela	Traditional v.	FO Wadagamba	4 years	GN 73	3 months by AI at ASC	Workshop, DAS	Bicycle
			FA-G5	FA	37	M	O Level	GN 52 & 55	Tract 4/minor	FO Tract 4	4 years	GN 52	3 months by AI at ASC	Workshop, DAS	Bicycle
			FA-G6	FA	31	F	O Level	53 Karawalagas	Tract 5	FO Tract 5	3 years	GN 53	3 months by AI at ASC		On foot
		Mahananneriya	FA-M1	FA	36	M	O Level	47 Jayabima	Tract 6	FO Tract 6	3 years	GN 47	3 months by AI at ASC		Bicycle
Periyakulama	Tirappane	Tirappane	FA-T1	ADPA	36	F	A Level	561 Wana. Uyana	Whole scheme	FO Periyakul.	5 years	GN 561	3 months by AI at ASC	Agriculture, O&M	On foot
Mahananneriya	Galgamuwa	Mahananneriya	FA-M2	FA	33	F	O Level	GN 36 & 37	Whole scheme	FO Mahanan.	3 years	GN 36	3 months by AI at ASC	B. onion	Bicycle
Cascade VII - Kallanchiya	Galgamuwa	Galgamuwa	FA-G7	FA	25	F	O Level	58 Kallanchiya	Whole scheme	FO Paddy Prod.	3 years	GN 85	3 months by AI at ASC		On foot
- Attikulama	Galgamuwa	Galgamuwa	FA-G8	ADPA	25	F	Univ. Graduate	54 Ihala Palukan.	Whole scheme	FO Attikulama, FO Ihalagama	5.5 years	GN 54	3 months by AI at ASC	Samurdi, soil conserv.	Bicycle
- Ihalagama	Galgamuwa	Mahananneriya													
- Palu-Mailawewa	Galgamuwa	Mahananneriya	FA-M3	ADPA	28	M	A Level	GN 46 & 48	Whole scheme	FO Mailawewa, FO Tambarewewa, FO Ihalananneriya	5.5 years	GN 48	3 months by AI at ASC	Samurdi training	On foot
- Tambarewewa	Galgamuwa	Mahananneriya													
- Ihalananneriya	Galgamuwa	Mahananneriya													

Table M 10.3 Extension Management System of IPEU and PDOAs

Agency		Provincial Office	District Office	Divisional Office	Field Level
Inter-Provincial Extension Unit (DOA)	Staff		<ul style="list-style-type: none"> - Head of Unit, ADA - Technical Staff 	<ul style="list-style-type: none"> - AO: Head of Segment Office - AIs at Segment Office 	<ul style="list-style-type: none"> - AIs at ASC
	Management System		<ul style="list-style-type: none"> - Monthly meeting of all staff of Unit - Progress monitoring & guidance 	<ul style="list-style-type: none"> - Fortnightly meeting of all segment staff including AIs - Progress monitoring & guidance 	
	Formulation of Seasonal Extension Programs		<ul style="list-style-type: none"> - Finalize seasonal work programs of Unit & propose to DOA 	<ul style="list-style-type: none"> - Discuss work program prepared by AIs in fortnightly meeting 	<ul style="list-style-type: none"> - Preparation of proposal based on local specific conditions and needs - Farmer Animator may provide assistance in site selection & farmer grouping
	Implementation of Extension Programs		<ul style="list-style-type: none"> - Field supervision & guidance on programs carried out by AIs - Provide guidance to AOs/AIs at monthly meeting - Progress monitoring 	<ul style="list-style-type: none"> - Field supervision & guidance on programs carried out by AIs - Provide guidance to AOs/AIs at fortnightly meeting - Progress monitoring & reporting 	<ul style="list-style-type: none"> - Implementation of field extension programs mostly with small farmer groups - Provide training/guidance to participants - Periodical visit to program sites - Progress reporting
	Field Extension		<ul style="list-style-type: none"> - Field supervision & guidance to AIs & participants (limited) 	<ul style="list-style-type: none"> - Field supervision & guidance to AIs & participants 	<ul style="list-style-type: none"> - Visits to service areas not covered by extension programs (limited)
	In-service Training System of AIs				<ul style="list-style-type: none"> - Pre-seasonal training of AIs at ISTI (3-5 days) - Guidance at periodical meeting - In-service training on special subjects
PDOA	Staff	<ul style="list-style-type: none"> - Provincial Director, Head - Head of Division - Technical Staff 	<ul style="list-style-type: none"> - Head of District Office, DDA - Technical Staff 	<ul style="list-style-type: none"> - Segment ADA (NWP) - Divisional ADA (NCP & NWP) - AIs at Div. Office 	<ul style="list-style-type: none"> - AIs at ASC
	Management System	<ul style="list-style-type: none"> - Monthly meeting of all staff (NCP) - Monthly meeting of all senior staff (NWP) 	<ul style="list-style-type: none"> - Monthly meeting of all PDOA staff (NCP) - Monthly meeting of all district staff (NWP) 	<ul style="list-style-type: none"> - Fortnightly meeting of all division staff including AIs (NCP) - Weekly meeting of all division staff including AIs (NWP) 	
	Formulation of Seasonal Extension Programs	<ul style="list-style-type: none"> - Discuss work program prepared by District Office in monthly meeting - Finalize seasonal work programs 	<ul style="list-style-type: none"> - Discuss work program prepared by Div. Office in monthly meeting - Prepare district level work program 	<ul style="list-style-type: none"> - Discuss work program prepared by AIs at fortnightly meeting (NCP) - Discuss work program prepared by AIs at weekly meeting (NWP) 	<ul style="list-style-type: none"> - Preparation of proposal based on local specific conditions and needs - Farmer Animator may provide assistance in site selection & farmer grouping
	Implementation of Extension Programs	<ul style="list-style-type: none"> - Supervision & guidance on programs carried out by AIs - Provide guidance to AOs/AIs at monthly meeting - Progress monitoring 	<ul style="list-style-type: none"> - Supervision & guidance on programs carried out by AIs - Provide guidance to AIs at fortnightly meeting - Progress monitoring & reporting 	<ul style="list-style-type: none"> - Field supervision & guidance on programs carried out by AIs - Provide guidance to AIs at fortnightly meeting - Progress monitoring & reporting 	<ul style="list-style-type: none"> - Implementation of field extension programs mostly with small farmer groups - Provide training/guidance to participants - Periodical visit to program sites
	Field Extension	<ul style="list-style-type: none"> - Field supervision & guidance to AIs & participants (limited) 	<ul style="list-style-type: none"> - Field supervision & guidance to AIs & participants (limited) 	<ul style="list-style-type: none"> - Field supervision & guidance to AIs & participants 	<ul style="list-style-type: none"> - Visits to service areas not covered by extension programs (limited)
	In-service Training System of AIs				<ul style="list-style-type: none"> - Pre-seasonal training of AIs at ISTI (3-5 days) - Guidance at periodical meeting - In-service training on special subjects

Table M 10.4 Implementation of Agricultural Extension Programs in 1999 in the Project Areas - 1/2

Scheme	Implementation Agency	Extension Staff Involved		Programs Implemented or Scheduled in 1999			
		Staff	No.	Program	No.	Program	No.
Nachchaduwa (Area: 2,540 ha)	IPEU, DOA	AI	4	Paddy Field: 1999 Yala Season		Paddy Field: 1999/2000 Maha Season	
		ADPA	5	- Paddy tract demonstration	26	- Paddy tract demonstration	25
		FA	8	- Paddy seed production program (1 acre)	26	- Paddy seed production program	15
				- Self seed production program (2 kg/unit)	58	- Paddy yield maximization program (1 acre)	7
				- Paddy yield maximization program (1 acre)	16	- Banana demonstration	1
				- Millet demonstration program (0.5 acre)	5	- Weed control demonstration (1 acre)	1
				- Weed control demonstration (1 acre)	11		
				- Maize demonstration farm (4 ha)	1	Highland/Home Garden: 1999/2000	
				- B. onion demonstration with storage facility	2	- Vegetable demonstration (agro-well; 1 acre)	1
				- Vegetable demonstration (0.5 acre)	1	- Agro-well demonstration (annual cultivation)	2
				- Varietal trial, paddy	2	- Maize demonstration	2
				- Chili nursery program	1	- Maize seed production	2
				- Sweet potato demonstration (new variety; 0.5 acre)	1	- Chili & fruit demonstration	20
						- Women farmer program	6
						- Integrated farming system program	1
Scheme	Implementation Agency	Extension Staff Involved		Programs Implemented or Scheduled in 1999			
		Staff	No.	Program	No.	Program	No.
Palukadawela (Area: 956 ha)	PDOA, NWP	AI	3	Paddy Field: 1999 Yala Season		Paddy Field: 1999/2000 Maha Season	
		FA	7	- Paddy seed production program (10 ha)	1	- Paddy tract demonstration	3
				- Maize demonstration (4 ha)	1	- Paddy yield maximization program (1 acre)	1
				- B. onion demonstration (0.1 ha)	1	- Paddy seed production program (1 acre)	1
				- Millet demonstration (2 ha)	3	- Paddy demonstration (2 ha)	1
				- Groundnut demonstration (1-2 ha)	3	- Banana demonstration (2 ha)	1
				*** no programs in Tract 4-6 due to water shortage			
				Highland/Home Garden: 1999/2000			
				- Perennial crops promotion program (seedling supply)			
				- Integrated farming system program (conservation + crop)			
				- Fruit seedling supply program			

Table M 10.4 Implementation of Agricultural Extension Programs in 1999 in the Project Areas - 2/2

Scheme	Implementation Agency	Extension Staff Involved		Programs Implemented or Scheduled in 1999			
		Staff	No.	Program	No.	Program	No.
Periyakulama (Area: 91 ha)	PDOA, NCP	AI	1	Paddy Field: 1999 Yala Season		Paddy Field: 1999/2000 Maha Season	
		ADPA	1	- IPM combined with yield increase program (14 ha)	1	- IPM combined with yield increase program (12 ha)	1
				Highland/Home Garden: 1999/2000		- Seed production program (4 ha)	1
				- Fruit seedling supply program	18	- Self seed production program (1 kg/unit)	24
Mahananneriya (Area: 158 ha)	PDOA, NWP	AI	1	Paddy Field: 1999 Yala Season		Paddy Field: 1999/2000 Maha Season	
		FA	1	- OFC seed production program (seed supply)	4	- Paddy tract demonstration	1
				Highland/Home Garden: 1999/2000		- Self seed production program (1 kg/unit)	20
				- Upland crops demonstration	2	- Weed control program (herbicide trial; 1 acre)	1
				- Fruit seedling supply program	13		
Cascade VII							
- Kallanchiya (Area: 8 ha)	PDOA, NWP	AI	1	Paddy Field: 1999 Yala Season		Paddy Field: 1999/2000 Maha Season	
		FA	1	- Paddy demonstration (1.5 acre)	1	- New variety introduction, paddy (seed supply; 0.1 ha)	1
				Highland/Home Garden: 1999/2000		- Fertilizer trial, paddy (1 acre)	1
				- Agro-well demonstration (0.25 acre)	1	- Weed control program (herbicide trial; 1 acre)	1
				- Maize tract demonstration (5 acre)	1		
- Attikulama (Area: 12 ha)	PDOA, NWP	AI	1	Paddy Field: 1999 Yala Season		Paddy Field: 1999/2000 Maha Season	
		FA	1	*** no programs due to water shortage		- IPM (entire command area; 12 ha)	1
- Ihalagama (Area: 22 ha)	PDOA, NWP	AI	1	Paddy Field: 1999 Yala Season		Highland/Home Garden: 1999/2000	
		FA	1	- Paddy tract demonstration	1	- Fruit demonstration & seedling supply	
				*** no programs 1999/2000 maha in paddy field			
- Tambarewewa (Area: 29 ha)	PDOA, NWP	AI	1	Paddy Field: no programs in 1999/2000 yala & maha		Highland/Home Garden: 1999/2000	
		FA	1			- Fruit demonstration & seedling supply	
- Palu-Mailawewa (Area: 20 ha)	PDOA, NWP	AI	1	Paddy Field: no programs in 1999/2000 yala & maha		Highland/Home Garden: 1999/2000	
		FA	1			- Fruit demonstration & seedling supply	
- Ihalananneriya (Area: 26 ha)	PDOA, NWP	AI	1	Paddy Field: 1999 Yala Season		Paddy Field: 1999/2000 Maha Season	
		FA	1	- Paddy tract demonstration	1	- Paddy tract demonstration	1
				Highland/Home Garden: 1999/2000			
				- Fruit demonstration & seedling supply			

Table M 10.5 Deployment of Livestock Extension Staffs and Extension Programs in the Project Areas

Project Related VS Office Location & Agencies	Service Areas / Related AS Center	Project Scheme in Service Area	Staffing / Office Facilities	Major Activities/Constraints of VS Office	Support Programs in Project Scheme (1999)
Nuwaragam Palata East at Anuradhapura, PDAPH, NCP	DS Nachchaduwa	Nachchaduwa	VS	Major Activities	- Nachchaduwa Scheme
			LDI	- Health services: vaccination, treatment (animals & pets)	Goat distribution program: 10 units
	DS Nuwaragam Palata East (48 GN divisions)		Treatment Room	- Breeding: AI, pre-diagnosis, castration	Heifer cow distribution program: 1 unit
			VS room	- Extension: farmer training & field visit	Cattle shed program: 2 units
	ASC Nuwaragam Palata East		Office	- Support Programs in 1999	Farmer training (under PRDP)
			VS quarter	Goat distribution program: 20 units	AI, vaccination
			Jeep	Heifer cow distribution program: 9 units	
			Motorcycle	Cattle shed program: 5 units (Rs.10,000/shed)	
				Farmer training (under PRDP)	
				Major Constraints	
				- Poor mobilization (transportation & fuel allowances)	
				- Poorly staffed, pet treatment being forced	
				- Farmers less interested animal in when busy	
Tirappane, PDAPH, NCP	DS Tirappane (42 GN divisions)	Periyakulama	VS	Major Activities	- Periyakulama Scheme
			LDI	- Health services: vaccination, treatment	Goat distribution program: 6 units (1997)
	ASC Tirappane (1 LDI) ASC Siwalakulama(part) ASC Muriyakadawala(part) ASC Indigahawewa(part)		Treatment Room	- Breeding: AI, pre-diagnosis, castration	Farmer training (1 day)
			VS room	- Extension: farmer training & field visit	AI, vaccination
			Office	- Support Programs in 1999	
			VS quarter	Goat distribution program: 18 units	
			Jeep	Farm program: 18 units(animal/planting material supply)	
			Motorcycle	Major Constraints	
				- Poor mobilization (transportation & fuel allowances)	
				- Office equipment & facilities, communication means	
				- Low milk price	
				Major Activities	
Galgamuwa, PDAPH, NWP	DS Galgamuwa	Palukadawela	VS	- Health services: vaccination, treatment	- Palukadawela Scheme
			LDI	- Breeding: AI, pre-diagnosis, castration	Heifer cow distribution program: 5 units
	DS Ehetuwewa (97 GN divisions)	Mahananneriya	Treatment Room	- Extension: farmer training & field visit	- Mahananneriya Scheme
			VS room	- Support Programs in 1998	Goat distribution program: 4 units
	ASC Galgamuwa (2 LDIs)	Attikulama	Office	Cattle distribution programs: 28 units	- Attikulama Scheme
			VS quarter	Farmer training: 58 classes	Goat distribution program: 5 units
	ASC Mahananneriya (1 LDI)	Ihalagama	Jeep (1 for 2 VSOs)	Goat distribution program: 22 units	Stud bull distribution program: 1 unit
			Motorcycle	Swine development program: 174 units(issued)	Layer supply program: 5 units (10 layers/unit)
	ASC Ehetuwewa (2 LDIs)	Tambarewewa		Major Constraints	- Tambarewewa Scheme
				- Low interests of farmers; 3rd priority following paddy/OFC	Stud bull distribution program: 1 unit
		Palu-Mailawewa		- Training programs not motivate farmers	- Ihalananneriya Scheme
				- Poor mobilization (transportation & fuel allowances)	Goat distribution program: 6 units
		Ihalananneriya			Layer supply program: 5 units (10 layers/unit)

Table M 10.6 Deployment of Agricultural Extension Staffs and Extension Programs in the Project Areas: NAQDA, CCB & ADA

Agencies, Project Related Agencies & Location	Service Areas / Related ASC	a in Service Area	Staffing / Office Facilities	Major Activities/Constraints of Office	Support Programs in Project Scheme ('99-00)	
NAQDA	Anuradhapura Dist.	Nachchaduwa	AEO	1	- Nachchaduwa Scheme	
Aqua-culture Extension Center		Periyakulama	Aqua-culturalist	1	Promotion of cage culture 4 cages (in 2000)	
Anuradhapura			Assit. AEO	1	Supply of fishing boat 5 units	
			FI (Fisheries Inspector)	4	Supply of fishing gear 12 units (in 2000)	
	ASCs in Anur.			- Promoting fish culture in tanks(major/medium/minor)	Farmer training	
				- Promotion of cage culture in tanks(fry & fingerling prod.)		
			Pickup-Wagon	1		
			Truck	1	- Periyakulama Scheme	
			Motorcycle	2	No program	
			Training Equip. (set)	1		
			Computer Set	1		
			Office (rented)			
				Major Constraints		
				- No proper center buildings & training facilities		
				- No demonstration fish ponds		
				- Shortage of transportation means(motorcycle)		
NAQDA	10 DS divisions	Palukadawela	FI (Fisheries Inspector)	1	- Palukadawela Scheme	
Aqua-culture Extension Office	including	Mahananneriya	Assit. AEO	1	Fish fingerling supply (10,000 - 15,000 in 1997)	
Nikaweratiya	Galgamuwa	Cascade VII				
			No office established yet	- Fish fingerling supply to fish ponds	- Mahananneriya Scheme	
				- Supply of fishing boat & gears		
			FI stationed at DS office & Assit. AEO at Panduwasnuwara	- Farmer training & organization		
				- Fisheries village development program	- Cascade VII	
				Major Constraints		
				- No center established yet		
CCB				Major Activities	Others	
Divisional Office			CDO	1	- Extension programs	
Galgamuwa				- Distribution of seedling under subsidy scheme	- Coconut Seedling Nursery	
				- Subsidy scheme: New planting - Rs. 16,000/acre	Galgamuwa	
				- Subsidy scheme: Inter-cropping - Rs. 4,000/acre		
CCB			CDO	1		
Divisional Office				- Loan scheme: Interest subsidy to support subsidy scheme		
Nuwaragam Palata East				Interest: 1st year - born by CCB; 2nd year - 50% by CCB		
ADA	6 DS divisions	Periyakulama	ARPO	1	Major Activities	Others
Divisional Office	including Tirappane		Clerical Staff	1	- Construction of agro-well under subsidy of Rs. 30,000/well	- Current well size: dia.: 15 fts, depth: 20 fts
ASC Tirappane			Pickup	1	- Supporting beneficiaries on procurement of farm inputs, farm tools & equipment, water pump etc.	- Expected command are: 1 - 1.5 acre in dry spell
				- Extension service in agro-well irrigated area by AI;	- Hydro-geological sounding by Water Resources Board: Rs. 6,500/site	
ADA	DS Galgamuwa	Palukadawela	ARPO	1	- Target crops:	
Divisional Office	DS Ehetuwewa	Mahananneriya	Clerical Staff	1	OFC/vegetables in paddy field & rainfed area	
ASC Galgamuwa	DS Polipitigama	Cascade VII	Pickup	1	Fruits are limited in extent	
	DS Giribawa					

AEO: Aqua-culture Extension Officer, Asst. AEO: Assistant Aqua-culture Extension Officer; CDO: Coconut Development Officer; ARPO: Agricultural Research & Production Officer

Table M 10.7 Inventory on Project Related Agrarian Service Centers and Committees- 1/3

1. Data on Agrarian Service Division

Items	Anuradhapura District		Kurunegala District	
	AS Center Swarstipura	AS Center Tirappane	AS Center Galgamuwa	AS Center Mahananneriya
1. Related DS Division	Nachchaduwa, Nuwaragam P.E	Tirappane	Galgamuwa, Ehetuwewa	Galgamuwa
2. GN Divisions in Service Area	18	22	49	15
3. Villages in Service Area	37	52	147	32
4. Population in Service Area	18,916	16,044	42,633	11,998
5. Household in Service Area	5474	5,868	12,995	2,970
6. Farm Household in Service Area	4,927	2,968	8,206	2,970
7. Land Use				
Farm Land (ha)	6,311	6,976	11,867	6,546
Paddy Field (ha)	3,170	2,197	4,119	1,172
Upland Field (ha)	3,141	4,779	7,748	5,374
Forest/Crown Land (ha)	2,743	3,880	607	468
Others (ha)	1,392	1,413	418	936
8. Land Holding				
Farm Land per Farm Family (ha)	1.28	2.35	1.45	2.20
Paddy Field per Farm Family (ha)	0.64	0.74	0.50	0.39

2. Data on Agrarian Service Center

Items	AS Center Swarstipura	AS Center Tirappane	AS Center Galgamuwa	AS Center Mahananneriya
1. Offices at ASC				
Agrarian Service Committee	x	x	x	x
DO Office	x	x	x	x
AI Office	x	x	x	x
AM Office		x	x	
Others				
- Agrarian Development Committee	x			
- Farmer Bank	will be opened			
- Multipurpose Cooperative Bank		x		
- Multipurpose Cooperative Shop		x		
- Seed Store				x (6 x 9m)
- Chemical Store				x
- Farmer Animators Office			x	
2. ASC Facilities				
Meeting Room	x	x	x	x
Store (capacity: ton)	20(no roof)	20	20	20
4W Tractor (No.)	1(unserviceable)	1	1	1
2W Tractor				
Reaper (No.)	1	1	1	
Garage	x			
Water Supply	tap water	shallow well	not available	deep tube well
Electricity Supply	available	available	available	not available
Tractor Garage	x	x	x	x
Others				
3. Deployment of Field Officer/Frequency of Visit				
DO	stationed	stationed	stationed	stationed
ADA	at DSO, N.P.E	at DSO, Tirappane	at Segment Maho	at Segment Maho
AI	4 (stationed)	2 (stationed)	4 (stationed)	2 (stationed)
LDI	at VSO, N.P.E.	at VSO, Tirappane	at VSO, Galgamuwa	at VSO, Galgamuwa
Farmer Animator	15 (at GN div.)	21	35 (at GN div.)	5 (at GN div.)
ADPA			8 (at GN div.)	6 (at GN div.)
KVS	1(stationed)			
TO, DAS				1 (stationed)
AM		1 (stationed)	1 (stationed)	
Others				
4. Extension Service Area per AI (ha)				
Farm Land (ha)	1,578	3,488	2,967	3,273
Paddy Field (ha)	793	1,099	1,030	586

Source: Office file of AS Centers & results of interview with DO

Table M 10.7 Inventory on Project Related Agrarian Service Centers and Committees- 2/3

3. Data on Agrarian Service Committee & Govijana Sanwardana Sabah

Items	AS Center Swarstipura	AS Center Tirappane	AS Center Galgamuwa	AS Center Mahananneriya
1. Agrarian Service Committee Staff				
Committee Clerk	1	1	1	1
Salesman			1	
Caretaker	1	1	1	1
Tractor Operator		1	1	1
Watcher			1	
2. Agrarian Service Committee Member				
Member FOs	10 (all: paddy farmer)	10 (9: paddy farmer)	10 (all: paddy farmer)	10 (all: paddy farmer)
Membership of FOs				
Chairman	FO representative	FO representative	FO representative	FO representative
Secretary	DO	DO	DO	DO
Member	DO, AI(4), LDI, RPM	DO, AI(2), LDI, AM	DO, AI(4), LDI, AM, CDO	DO, AI(2), LDI, CO
3. Govijana Sanwardana Sabah Member				
Member FOs	26 (all: paddy farmer)	30 (27: paddy farmer)	54 (50: paddy farmer)	32 (all: paddy farmer)
Membership of FOs	2,657	1,587	3,535	1,404
Chairman	FO representative	FO representative	FO representative	FO representative
Secretary	FO representative	Committee clerk	DO	DO
Member	DO, AI(4), LDI, RPM	DO, AI(2), LDI, AM, (DS)	DO, AI(4), LDI, AM, CDO, Agr. I. O	DO, AI(2), LDI, CO

4. Data on Activities of Agrarian Service Committee

Items	AS Committee Swarstipura	AS Committee Tirappane	AS Committee Galgamuwa	AS Committee Mahananneriya
1. Business Activities in 1998				
Sales of Fertilizer	0	5.7 ton	Rs. 1,131,000	8 ton
Sales of Rice Seed	0	0	Rs. 88,000	1 ton
Sales of Agro-chemicals	0	0	Rs. 260,000	80 l
Other Seeds & Planting Materials (Rs.)	0	34,678	0	45,000
Total Sales Amount (Rs.)	26,000	195,991	40,266	141,000
2. Farmer Training Activities in 1998				
Farming Practices (course)	18	2	7	3
Water Management (course)		5		
Farmer Organization (course)		2	5	2
Marketing(course)	1	1		
Others (course)		1		
3. Staff Training Activities in 1998				
Farmer Animator Training	2	2	2	3 months by AI
Others (course)		2	1	1
4. Farmer Bank				not functioning
Member FOs	3	2,593	17	10
Membership	265	saving accounts	1,075	523
Borrower in Maha 1999 (Rs.)	0	with	30	0
Credit Amount in Maha 1999 (Rs.)	0	Cooperative Bank	100,000	0
Credit per Recipient (Rs.)			3,333	0
5. Rural Credit Institutions in ASC Area and Those Located Closer	Coop. Rural B. (2) Samurdi Bank (2) SANASA Bank Banks in Anuradhapura	Bank of Ceylon Rajarata Dev. Bank Coop. Rural Bank	Bank of Ceylon Peoples Bank Wayamba Dev. B. Coop. Rural Bank	Coop. Rural Bank Samurdi Bank Banks in Galgamuwa
6. Other Activities in 1998				
Seed Production Program 1998 Yala	0	32.5 acres	0	0
1999 Maha	0	45 acres	3 acres	14 acres
7. Operational Problems of AS Center	Shortage of funds Renovation of store Office facilities	Well dry up in yala No fence & gate Office/training facilities	No water supply Office facilities Communication	Water quality No electricity Office facilities
8. Management Problems of AS Committee	Shortage of funds Less interest of FO Poor economic activity	Shortage of funds Officers attendance low Less interest of farmer	Shortage of funds Less interest of FO Membership limited	Shortage of funds Less interest of farmer Poor economic activity

Source: Office file of AS Centers & results of interview with DO

Table M 10.7 Inventory on Project Related Agrarian Service Centers and Committees- 3/3

5. Financial Status of Agrarian Service Committee: Profit and Loss Statement: 1998/99

Unit Rs.

Items	AS Committee Swarstipura	AS Committee Tirappane	AS Committee Galgamuwa	AS Committee Mahananneriya
1. Income				
Sales Profits of Farm Inputs	-	-	49,860	6,709
Hiring Service of Tractor/Reaper	4,593	10,462	42,870	-
Room Rent	7,560	16,614	9,828	-
Acreage Tax	21,012	12,871	50,718	21,153
Bank Interest	14,500	-	3,125	-
Profit brought forward	-	20,022	-	-
Others	16,791	3,879	13,520	1,426
Total Income	64,456	63,848	169,921	29,288
2. Expenditure				
Institutional Expenses	199,476 1/	13,877	85,483	31,257
Administrative Expenses	17,238	18,424	119,530	135,926
Sales Costs	14,340	-	-	10,613
Others	250	4,881	-	-
Total Expenditure	231,304	37,182	205,013	177,796
3. Profit or Loss				
Profit		26,666		
Loss	-166,848		-35,092	-148,508

1/: Including depreciation costs of some Rs. 170,000.-

5. Financial Status of Agrarian Service Committee: Balance Sheet: as of December 1998

Unit Rs.

Items	AS Committee Swarstipura	AS Committee Tirappane	AS Committee Galgamuwa	AS Committee Mahananneriya
Assets				
1. Fixed Asset				
Tractor Shed	2,064	-	14,469	4,650
Office Equipment	13,808	-	17,690	8,722
Tractor/Trailer	283,678	-	193,870	295,424
Reaper	247,778	-	-	-
Others	4,133	-	647	-
Subtotal	551,461	-	226,676	308,796
2. Current Asset				
Incomplete Contract	51,202	-	-	-
Loan Balances of FOs & Others	278,142	-	-	205,600
Fixed Deposit	150,000	-	-	-
Bank Balances	133,003	106,716	177,164	64,562
Others	146,360	-	168,159	217,340
Subtotal	758,707	-	345,323	487,502
Total Assets	1,310,168	356,167	571,999	796,298
3. Profit & Loss				
Cumulative Loss	166,848	28,078	-	619,443
Total	1,477,016	384,245	-	1,415,741
Liabilities & Capital				
1. Liabilities				
Uncompleted Contract	44,427	-	-	-
Ceylon Fertilizer Company	274,827	-	15,147	45,571
Carried Over Liabilities	95,347	-	-	-
Debt to DAS	936,621	-	279,195	903,711
Loan	-	-	75,000	87,843
Others	9,831	-	213,067	78,578
Total Liabilities	1,361,053	375,996	582,409	1,115,703
2. General/Revolving/Agriculture Funds	115,963	8,249	-	300,038
Total	1,477,016	384,245	-	1,415,741

Source: Office file of AS Centers & results of interview with DO

Table M 10.8 Project Related Research Institutes

<p align="center">Rice Research and Development Institute (RRDI), Batalegoda, Kurunegala District</p> <p>The RRDI has the mandate to conduct research and development activities related to rice. The Institute is entrusted with the responsibility of developing appropriate technologies to increase the productivity of rice in a wide range of agro-ecological environments. Rice research and development activities of DOA/RRD are currently being directed towards increasing the national average yield from the present level of 3.5 t/ha to 4.5 t/ha by the turn of the century. The major causes for the wide gaps between research and farm rice yield identified by the RRDI include: 1) limited adoption of proper technology by farmers, 2) planting of less adapted varieties, 3) low soil productivity, 4) pests, diseases and weed, and 5) poor on-farm water management.</p>
<p align="center">Field Crops Research and Development Institute (FCRDI), Maha Illuppallama</p> <p>The FCRDI is the central research institution having mandate to conduct field crops research and development and has the long lasting mandate to undertake research for farming systems of the low-rainfall region. Finding environmentally sound and economically viable alternatives to shifting cultivation and the development of sustainable and productive farming systems for rainfed uplands are major objectives of the Institute. While, attention is given to problems of irrigated farming as well and has Water Management Group in the Institute. The target commodities of the Institute are condiment crops (chili & onions) and grain legumes (cowpea, mung beans, pigeon pea, black gram etc.). The Farm Mechanization Research Center (FMRC) of DOA being the national institute for research and development on farm Mechanization is attached to the Institute. It is vested with the responsibility of testing and evaluation of agricultural machinery and implements and developing appropriate Mechanization technologies.</p>
<p align="center">Horticultural Crop Research and Development Institute (HORDI), Gannoruwa</p> <p>Having the function as the central research institution for horticultural crops, the HORDI has mandate to conduct research and development on vegetables, fruits, tuber & root crops, flower mainly for the Mid Country and basic research and varietal development. The activities taken by the Institute concern the production of superior varieties of mandated crops, improved crop management methods and better plant health with minimal dependence on chemicals. In addition, the co-ordination for the technology transfer is an important function of the Institute.</p>
<p align="center">RARDC Makandura, Kurunegala District</p> <p>The Center caters to the horticultural crop research and development needs of Gampaha, Kurunegala and Puttalam Districts. It has mandate to conduct research and development activities on fruits, vegetables and tuber & root crops for the Low Country and the production of horticultural planting materials. The Center has 2 Agricultural Research Stations and 3 Adaptive Research Units (ARUs) handling location-specific research programs and 1 Horticultural Farm under its administration. The activities of the ARU Inginiyitiya located close to the Project areas include OFC cultivation in irrigated areas.</p>

Table M 10.9 Project Related Credit Institutions

Formal Institutions
<p>A number of institutions are involved in the delivery of formal credit in and around the Project areas. The major credit institutions include the Central Bank of Sri Lanka (CBSL), the People's Bank (PB), the Bank of Ceylon (BC), Raja Rata Development Bank, Wayamba Development Banks (WDB) and Hatton National Bank (HNB).</p> <p>The CBSL has a function as the executing agency for foreign funded credit schemes. The Bank is responsible mainly for admitting PCIs, issuing Operating Instructions to PCIs, disbursing refinance to PCIs in respect of loans under the projects. The PB is state commercial bank actively involved in rural banking and credit sector. It has branches in Anuradhapura and Galgamuwa, of which service areas cover the Project areas in NCP and NWP, respectively. The CB is a state commercial bank and plays an important role in its contribution toward the socio-economic development in the rural area of the country. Its project related branches are Anuradhapura City branch, Tirappane branch and Galgamuwa branch. The WDB was established in 1999 as a province-based rural development bank through the restructuring and amalgamation of the district-based Regional Rural Development Banks (RRDBs) in NWP. The main purpose behind the establishment of the province-based development bank is to concentrate more on the poor and the weaker segments of the rural community. It has a branch in Galgamuwa and its service area cover the Palukadawela, Mahananneriya and Cascade VII of the Project. The Raja Rata Development Bank in NCP is the same type of province-based regional development bank established in 1998. Its Anuradhapura branch and Tirappane branch provide credit services in Nachchaduwa and Periyakulama Scheme, respectively. The HNB is a private commercial bank extensively participating in the rural credit schemes. It has branches in Anuradhapura and Kurunegala, which covers the project scheme areas of in NCP and NWP, respectively.</p>
Semi-formal and Non-formal Institutions
<p>The major credit institutions in the Project areas categorized under the semi-formal and non-formal sectors include the Co-operative Rural Bank (CRB), Thrift and Credit Co-operative Societies (TCCS) and Samurdhi Bank Societies (SBS) and non-formal institutions such as pawning shops, professional and semi-professional money lenders, rice millers/traders, farm inputs suppliers and etc.</p> <p>The CRB and TCCS are semi-formal organisations. They are voluntary organisations registered under the Co-operative Law, which mobilise savings from and make loans to the membership. Their organisational set-up consists of the primary societies at village levels and the district unions at district levels. The SANASA (National) Federation is an apex body of the TCCS at the central level. The CRB has in total of 5 branches in the Project related areas of Nachchaduwa, Tirappane, Mahananneriya and Galgamuwa and providing services to its members. The Tirappane branch is opened in the ASC Tirappane. Credit schemes of the TCCS are operated by the SANASA Development Bank. The SBS is an integral part of the Samurdhi Movement focus on mobilising savings from Samurdhi members and grant loans to them for undertaking income generation activities. In the Project related areas, there exist a SANASA bank in the Nachchaduwa Scheme area and 2 SBSs in Nachchaduwa and Mahananneriya. In addition, the Death Donation Societies (DDS) in the Project related rural communities are commonly providing micro credit to community members.</p> <p>The non-formal institutions appear to play a significant role in the supply of credit in the Project areas. Farmers sometimes prefer the non-informal institutions for credit sources due to its easy accessibility and quick dealings although the interest rates charged by the sector are sometimes considerably high compared with those of the formal sector. Such non-formal credit institutions include:</p> <ul style="list-style-type: none"> - Pawning shops that account for considerable portion in loan portfolio in the rural area. Current prevailing interest rate is around 24 % per annum. - Professional moneylenders who lend money even without proper collateral. Current prevailing interest rate is between 10 to 20 % per month. - Semi-professional or non-professional moneylenders comprising of rice millers/traders, farm inputs suppliers, shopkeepers, landlords and relatives. In case of rice millers/traders, they provide farm credit to custom farmers prior to crop season in cash or in kind and the capital and interest are collected at the time of purchasing products. The provision of farm credit by medium scale rice milers/traders is common in the Nachchaduwa Scheme. The prevailing interest rate is 20% for 4 months. In other schemes, rice traders provide credit without interest charge and purchase products at lower prices than market prices at that time.

Table M 10.10 Rural Credit Institutions Operated in the Project Areas and Their Coverage of Cultivation Loan and Pawning Schemes

Scheme	Related DS Division	Major Related Credit Institutions 1/	Cultivation Loan & Pawning Schemes	Major Cultivation Loan Coverage in 1999 for				Remarks
				1998/99 Maha Season Cropping		1999 Yala Season Cropping		
				No. of Beneficiaries	Total Credit Amount (Rs.000)	No. of Beneficiaries	Total Credit Amount (Rs.000)	
Nachchaduwa	Nachchaduwa	PB, Anuradhapura	NCRCS					
		BC, Anuradhapura	NCRCS					
		HNB, Anuradhapura	NCRCS					
		R. D. B., Anuradhapura City Branch	Cultivation Loan	23	361	38	546	Paddy & OFC
		C. R. B., Nachchaduwa Branch	Short Term Loan					
		C. R. B., Kuda Nelumbewa Branch	Short Term Loan Pawning	15 560	225 (coverage for Jan. to middle Dec. in 1999) 1,000 (coverage for Jan. to middle Dec. in 1999)			
		SANASA Bank, Nachchaduwa Branch						
		Samurdi Bank, Nachchaduwa Branch						
		Farmer Bank, ASC Swarstipura	Cultivation Loan		no cultivation loan scheme operated at present			
Palukadawela, Mahananneriya, Cascade VII	Galgamuwa	PB, Galgamuwa Branch	NCRCS	13	316	4	75	Paddy & OFC
		BC, Galgamuwa Branch	NCRCS Pawning	300 610	1,161 (coverage for Jan. to Nov. in 1999) 3,135 (coverage for Jan. to Nov. in 1999)			Paddy & OFC
		HNB, Kurunegala	NCRCS					
		W. D. B., Galgamuwa Branch	SUPALA Pawning	189 3,051	4,093 (coverage for Jan. to Nov. in 1999) 1,071 (coverage for Jan. to Nov. in 1999)			Paddy & OFC
		C. R. B., Galgamuwa Branch	Short Term Loan	22	150 (coverage of both seasons)			Only for paddy
		Farmer Bank, ASC Galgamuwa	Cultivation Loan	30	100 (coverage for 1999/00 maha crop)			Only for paddy
		C. R. B., Mahananneriya Branch	Short Term Loan					
		Samurdi Bank, Mahananneriya Branch						
		Farmer Bank, ASC Mahananneriya	Cultivation Loan		no cultivation loan scheme operated at present; will be resumed			
Periyakulama	Tirappane	BC, Tirappane Branch	NCRCS	2	23	1	8	Only for paddy
		R. D. B, Tirappane Branch	Cultivation Loan Pawning	5 1,780	90 4,196 (coverage in 1999)	13	157	Paddy & OFC
		C. R. B., ASC Tirappane Branch	Short Term Loan	200	1,000	0	0	Only for paddy

1/: PB: Peoples Bank; BC: Bank of Ceylon; HNB: Hatton National Bank; R.D.B.: Rajarata Development Bank; C.R.B.: Cooperative Rural Bank; W.D.B.: Wayamba Development Bank

Table M 10.11 Major Agriculture Credit Schemes Operated in the Project Areas

Type of Credit	Credit Scheme	Institutions Providing Credit	Bank Branches in/around Project Areas	Target Scheme 1/	Terms & Conditions of Credit	Credit Amount
Short Term Cultivation Loan for Paddy & OFC	NCRCS	Peoples Bank (PB)	Anuradhapura Galgamuwa	Nach, Peri Palu, Maha, Cas	Eligibility: - Customer of Bank & - Agro-Identity Card holder & - Not a defaulter of credit/loan	Paddy: Rs. 4,500/acre Chili : Rs. 5,000/acre
		Bank of Ceylon (BC)	Anuradhapura Galgamuwa Tirappane	Nach Palu, Maha, Cas Peri	Security: - Inter-se guarantee of 2 other farmers - Other security acceptable to Bank	
		Hatton National Bank (HNB)	Anuradhapura Kurunegala	Nach, Peri Palu, Maha, Cas	Interest: - 12% (interest subsidy by CBSL 10%) Loan Period: - 240 days Crop Insurance: - For paddy required; for OFC not required	
	SUPALA	Wayamba Development Bank (WDB)	Galgamuwa	Palu, Maha, Cas	Eligibility: - Customer of Bank & not a defaulter of credit - Owner cultivator & registered tenant	Paddy: Rs. 8,000/acre Chili : Rs. 20,000/acre
					Security: - Inter-se guarantee of 2 account holders with Bank Interest: - 12% (interest subsidy by CBSL 10%) Loan Period: - 6 months Crop Insurance: - Not required	
	Agricultural Credit	Rajarata Development Bank (RDB)	Anuradhapura Tirappane	Nach Peri	Eligibility: - Customer of Bank & not a defaulter of credit - Any farmer including seasonal tenant	Paddy: Rs. 12,000/acre Chili : Rs. 24,000/acre
					Security: - Inter-se guarantee of 2 account holders with Bank Interest: - 12% (interest subsidy by CBSL 9%) Loan Period: - 240 days Crop Insurance: - Required in areas having Crop Insurance operation - Nachchaduwa-required; Periyakulama-not required	
	Short Term Credit	Cooperative Rural Bank (CRB)	Nachchaduwa, Kuda Nelumbewa ASC Tirappane Maradankadawala Galgamuwa Mahananneriya	Nach Peri Peri Palu, Cas Maha, Cas	Eligibility: - Member of cooperatives & not a defaulter - Any farmer including seasonal tenant	Paddy: Rs. 10,000/farmer OFC: Rs. 10,000/farmer
					Security: - Inter-se guarantee of 2 cooperative members Interest: - 16 % Loan Period: - 6 months Crop Insurance: - Not required	
	Cultivation Loan	Farmer Bank, ASC Galgamuwa	Galgamuwa	Palu, Maha, Cas	Interest 16.5 %/annu.; Loan period 6 months; Individual	Rs. 5,000/acre
Credit for Procurement of Farm Machinery	Agri. Loan Project	PB	same as above	same as above	Interest 16 %/annu.; Loan period 3-5 years; Individual/Farmer Company	Depending on project
	Normal Term Loan	BC	same as above	same as above	Interest 16.5 %/annu.; Loan period max. 3 years; Individual	No limit set
	Development Scheme	HNB	same as above	same as above	Interest 17-19 %/annu.; Loan period max. 5 years; Individual	Max. Rs.5 million
	Agricultural Project	RDB	same as above	same as above	Interest 20 %/annu.; Loan period 3 - 5 years; Individual	75% of machinery price
	Agricultural Project	WDB	same as above	same as above	Interest 16 %/annu.; Loan period max. 5 years; Individual	No limit set
	SURATHURA	PB, BC, HNB, RDB	same as above	same as above	Interest 10 %/annu.; Loan period 3 years; Individual	Max. Rs.50,000/individual
Credit for Livestock	Medium Term Credit	CRB	same as above	same as above	Interest 15-16 %/annu.; Loan period 3 - 5 years; Individual	Max. Rs.250,000/member
	Agri. Loan Project	PB	same as above	same as above	Interest 16 %/annu.; Loan period 2 years; Individual/Farmer Company	Max. Rs.35,000/individual
	Normal Term Loan	BC	same as above	same as above	Interest 13.5 %/annu.; Loan period 3 years; Individual	Max. Rs.50,000/individual
	Development Scheme	HNB	same as above	same as above	Interest 17-19 %/annu.; Loan period max. 5 years; Individual	No limit set
	Livestock Project	RDB	same as above	same as above	Interest 16 %/annu.; Loan period 3 years; Individual	Depending on program
	Livestock Project	WDB	same as above	same as above	Interest 16 %/annu.; Loan period 5 years; Individual	No limit set
Credit for Marketing	Paddy/OFC Purchasing	PB	same as above	same as above	Interest 22-26 %/annu.; Period 6 months; Individual/Farmer Company	Depend. on store capacity
	Paddy/OFC Purchasing	BC	same as above	same as above	Interest 15 %/annu.; Period 6-9 months; Individual/Farmer Company	Depend. on store capacity
	Development Scheme	HNB	same as above	same as above	Interest 17-19 %/annu.; Loan period max. 1 year; Individual	Depend. on store capacity
	Paddy/OFC Purchasing	RDB	same as above	same as above	Interest 15 %/annu.; Period 6-9 months; Individual	Depend. on store capacity
Medium Term Loan	Micro	HNB	same as above	same as above	Interest 17-20 %/annu.; Loan period 3 years; Individual/FO/farmer group	Max. Rs.250,000/loan
Pawning	Enterprise Scheme	Medium term loan for micro enterprise development including procurement of machinery			Gami Puruduka Scheme with saving program; target group: individual/group	
	Pawning Scheme	RDB, WDB & BC	same as above	same as above	Interest 24 %/annu.; Loan period 1 year; Individual	
		CRB	same as above except Tirappane	same as above	Interest 23.5 - 24.0 %/annu.; Loan period 1 year; Individual	

1/: Nach- Nachchaduwa; Peri - Periyakulama; Palu: Palukadawela; Maha - Mahananneriya; Cas - Cascade VII

Table M 10.12 On-going Credit Schemes in and around the Project Areas

Short-term Loan
<p>The prevailing short-term credit schemes include the New Comprehensive Rural Credit Scheme (NCRCS) and the cultivation loan operated by the RDB, WDB and CRB. The performances of NCRCS and other cultivation loans by credit institutions in and around the Project areas in the cropping seasons of 1999 are shown in Table 2.10.10.</p> <p>The NCRCS is an agricultural credit scheme, which provide short-term cultivation loans for paddy and other food crops (OFC) cultivation and operated by the PB, BC and HNB in the Project areas. In the scheme, the Participating Credit Institutions (PCIs), which grant loans out of their own funds to eligible farmers, are provided with an interest subsidy of 10 percentage points by the CBSL to enable them to lend to farmers at 12 % per annum. Paddy and 30 other crops are included under the scheme.</p> <p>The cultivation loans for paddy and OFC by the RDB and WDB and the same for paddy by the CRB are also provided in and around the Project areas. Under the schemes, the credit institutions provide loans out of their own funds to beneficiaries. However, the schemes by the RDB and WDB are operated under the interest subsidy by the CBSL.</p> <p>Only individuals are eligible for the cultivation loans mentioned above and the loans are provided only land owner and registered tenant except the cases of the RDB and CRB, in which even seasonal tenants have access to the facilities.</p> <p>Another form of short-term loan in the agriculture sector is paddy/OFC purchasing loans operated by the PB, BC, HNB and RDB. The loans are provided to individuals and Farmer Companies having storage facility at the loan period of 6 to 12 months.</p> <p>The most common formal short-term credit facility in the Project areas is a pawning scheme operated by the BC, RDB, WDB and CRB. The coverage of the cultivation loan is extremely limited compare to the coverage of the pawning schemes in and around the Project areas.</p>
Medium Term Rural Credit
<p>The medium term credit schemes operated in the Project related areas include the Self-employment Promotion through Micro-Enterprise Credit (Surathura Scheme) and agricultural credit schemes by the PB, BC, RDB, HNB, WDB and CRB.</p> <p>The Surathura Scheme is categorised as a micro-finance and savings scheme and provides micro medium-term loans to the unemployed out of PCIs own funds for the purpose of supporting new micro-enterprises in agricultural and other sectors. The current scheme is the phase II of the scheme. The interest rate of the scheme is 10 % and the PCIs are provided with an interest subsidy of 10 percentage points by the CBSL. The major PCIs in the areas are .the PB, BC, HNB and RDB.</p> <p>The PB, BC, HNB, RDB, WDB and CRB are operating medium term loans for purchasing farm machinery and animals. The interest rates are in the range of 16 to 20 % and the loan periods are 3 to 5 years. The beneficiaries of the loans are individuals in principle, except of Farmer Company accepted by the PB. However, the HNB has a credit facility called the Micro Enterprise Scheme (Gami Puruduwa/GP) as shown in the Table. The scheme is open to both individuals and groups and the Scheme is promoted by establishing the G.P. unit at rural areas by the bank.</p>
Farmers Bank Scheme of DAS
<p>With the Agricultural Trust Fund (AFD) administered by the MOAL, the DAS introduced “Farmer Bank” Scheme in pilot scale in 1995. Under the scheme, the fund supplied by the AFD is provided to Agrarian Services Committee through the DAS as a short-term loan and the Committee sub-lends cultivation loans to the members (shareholders) of “Farmer Bank”, a sort of credit society, under group loan arrangement through FOs.</p> <p>The scheme is operated by the Productivity Development and Marketing Division of DAS at the central level and by the “Farmer Bank” office of the Committee at the AS Center level under the supervision of DO. The member of FOs is eligible to become a member of the Bank and to become a member of the Bank they have to buy a share of the Bank at par value of Rs. 100. The funds supplied by the AFD are to be distributed for the expansion of the scheme under the revolving arrangement. Within the project related 4 AS Centers, AS Center Swarstipura, Galgamuwa and Mahananneriya have the “Farmer Bank”, however, the operation of the Bank is continued only in the AS Center Galgamuwa. The recipients of the cultivation loan in 1999/2000-maha season is 30 farmers. .</p>

Table M 10.13 Credit Schemes Operated by the Rural Credit Department of Central Bank of Sri Lanka

Name of Project	Funding Agency	Broad Mission	Original Allocation	Interest Rates to Borrowers %	Disbursement up to Dec. 31, '98 (Rs. Mn.)	Recovery Rates
1. Second Perennial Crops Development Project (1998 - 2004)	ADB	Increase production & commercialization of perennial crops, development of nurseries, post-harvest handling & processing activities & marketing	US\$15.7Mn.	Av. weighted deposit rate + 2%	-	-
2. Southern Province Rural Development Project (1992 - 2004)	ADB	To improve quality of life of people in Southern Province	US\$8.1Mn.	14.0	342.5	-
4. North-Central Province Participatory Rural Dev. Project (1996 - 2002)	IFAD, SIDA, WFP	Poverty alleviation, improve food security & nutrition & increase employment opportunities for low-income families	SL Rs.153 Mn	Existing market rate	-	-
3. North-Central Province Rural Development Project (1997- 2003)	ADB	Poverty alleviation, improve food security & nutrition & increase employment opportunities for low-income families	SL Rs.43 Mn	Existing market rate	-	-
5. Food & Nutrition Promotion Credit Scheme (year commenced - 1997)	KR2	To increase food production & food processing techniques in the country	SL Rs.284 Mn	10.0	2.6	n.a.
6. New Comprehensive Rural Credit Scheme (NCRCS) (1986 onward)	PCIs with gov. interest subsidy	Upliftment of rural farmers who cultivate short-term food crops	-	12.0	422 97/98 Maha & 98 Yala	70 (overall)
7. Kegalle District Integrated Rural Development Project (revolving fund; 1997 - 2007)	Gov. of Sri Lanka	Uplift standard of living of people in the project area by promoting income-generating activities	SL Rs.100 Mn	10.0	50	n.a.
8. Surathura Program Phase II (1998 onward)	PCIs with gov. interest subsidy	Increasing income & improving living standards of unemployed educated youth by promoting self-employment among them	SL Rs.1,000 Mn (target)	10.0	575.2	59.0 (as at June 30, '98)
9. Japan U-Ko Micro Finance Project (2000 onward)	JBIC	To establish a cost effective and sustainable micro-credit delivery system to generate employment and improve saving habits	SL Rs. 1,300 Mn	20.0	To start from April, 2000	

Source: Annual Report 1998, Central Bank of Sri Lanka & CBSL

**Table M 11.1 Comparison of Water Analysis of Nachchaduwa Tank
with the Sri Lanka Standard for Drinking Water**

Parameter	Unit	NARA analysis 1993		NWSDB analysis 1999		Sri Lanka Standard	
		min.	max.	min.	max.	desirable	permissible
Temperature	°C	26	32				
Conductivity	uS/cm	207	623	260	360	750	3,500
pH		6.83	8.11	7.4	8.2	7.0-8.5	6.5-9.0
Dissolved oxygen	mg/l	3	9.4				
Total alkalinity	mg/l	24	130	80	130	200	400
Total hardness	mg/l as CaCO ₃	60	198	84	115	250	600
Calcium	mg/l	12.8	32.9				
Magnesium	mg/l	2.9	32.1				
Total iron	mg/l	0.08	1.98	0.5	0.15	0.3	1
Ammoniacal N	mg/l	0.01	0.93	0.2	0.6		0.06
Nitrate N	mg/l	0.04	2.32	0.9	7.5		10
Nitrite N	mg/l	0	0.1				0.01
Phosphate	mg/l	0	0.03	0.07	0.26		2
Chloride	mg/l	2.5	8.5	24	96	200	1,200
BOD	mg/l	3	19				
Organic matter	mg/l	2	10				
Turbidity	NTU	5	35	8	50	10	20
Sulphate	mg/l		9			200	400
Fluoride	mg/l					0.6	1.5

Table M 11.2 Water Analysis of the Attaragalla Tank

Month	pH	EC (ms/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temp. (°C)	Phosphate (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Chloride (mg/L)	Alkalinity (mg/L)	Total Hardness (mg/L)
1 January	8.40	0.36	33	1.4	29.0	0.000	-	0.007	75	30	140
2 February	-	-	-	-	-	-	-	-	-	-	-
3 March	8.10	0.43	10	2.2	29.0	0.000	0.009	0.014	80	40	160
4 April	7.53	0.51	48	6.7	32.0	0.171	1.371	0.032	55	10	120
5 May	-	-	-	-	-	-	-	-	-	-	-
6 June	8.60	0.41	10	6.2	34.0	0.220	0.245	0.007	75	10	110
7 July	8.50	0.42	10	7.0	29.0	0.021	0.138	0.018	70	20	140
8 August	7.20	0.50	20	8.0	28.0	0.025	0.203	0.017	95	20	170
9 September	7.70	0.65	140	5.7	29.0	0.013	0.116	0.038	210	10	250
10 October	8.00	0.63	80	6.2	31.0	0.104	0.132	0.045	140	30	230
11 November	6.20	0.48	10	5.7	31.0	0.024	0.000	0.022	95	20	150
12 December	7.90	0.24	10	3.8	28.6	0.030	-	0.007	5	20	60

Source : NWP Water Resources Development Project ,1997

Table M 11.3 Human Elephant conflict in the Galgamuwa D.S. Division

Around Palukadawala Major, Mahananneriya Medium and Mahananneriya Minor Schemes.

(i). Human Deaths

Year	Total for the year	Village	No./Age/Sex	Remarks
1997	5	Embalegama Meegalewa Sangappala Liyannagama Mahagalkadawala	1/-/M 1/-/M 1/-/M 1/-/M 1/-/M	- - - - -
1998	6	Mahananneriya Wetakoluwegama Walawaswa Wegedera Meegalewa	1/-/M 2/12/Children 1/-/M 1/-/M 1/-/M	- Getting too close to injured animal - - -
1999	6	Mahananneriya Usgala – Siyambalangamuwa Porothukadawala Galkiriyagama Medagama Palukadawala	1/-/M 1/-/M 1/-/M 1/-/M 1/-/F 1/-/M	

Source : Department of Wild Life conservation, Meegalewa

(ii). Wild Elephant deaths

Year	Total for the Year	Village	No./Age/Sex	Remarks
1997				
1998	3	- Galkiriyagama	1 2	- -
1999	-	-	-	-

Source : Department of Wild Life conservation, Meegalewa

(iii). Property Damage (House)

Year	Total No. reported for the year	Value as estimated by owner (Rs)
1997	23	286,160
1998	75	1,483,861
1999	43	712,294

Source : Department of Wild Life Conservation, Meegalewa

(iv). Crop Damage : requests for compensation

Year	No. of requests	Remarks
1997	168	Compensation paid rarely exceeds Rs. 1000
1998	203	-
1999	Not available	-

Source : Social Services Officer, Divisional Secretariat , Galgamuwa

**Table M 11.4 Human–Elephant conflict in the Tirappane DS Division
1997 to 1999**

Around Periyakulama Medium scheme

(i) Human deaths

Year	Total for the year	Village	No./Age/Sex	Remarks
1997	2	Ittikattiya	1/-/M	Killed in the home
		Kanumullegama	1/-/M	Killed in the field
1998	1	Pudukulama	1/-/M	Killed in the field
1999	-			

Source: Department of Wildlife Conservation, Beat Office, Ittikattiya

(ii) Wild elephant deaths

Year	Total for the year	Village	No./Age/Sex	Remarks
1997	1	Eruwewa	1/-/M	Gun shot injuries
1998	1	Periyakulama	1/-/M	Gun shot injuries
1999	2	Perimiyankulama	1/-/M	Gun shot injuries
		Elupethawewa	1/-/-	Gun shot injuries
	1	Ethungana	1/-/F	Killed for tusks

Source: Department of Wildlife Conservation, Beat Office, Ittikattiya

(iii) Property damage (house)

Year	Total for the year	Village	No.of incidents	Estimated value (Rs). Totaled for the year
1997	2	Ittikattiya	2	8,500
1998	15	Ittikattiya	8	134,000
		Periyakulama	6	
		Pudukulama	1	
1999	1	Pudukulama	1	8,150

Source : Department of Wildlife Conservation, Beat Office, Ittikattiya.

(iv) Crop damage

Compensation is paid by the Social Services Officer attached to the Divisional Secretariat. It has not been possible to obtain a breakdown of payments.

**Table M 11.5 Human-elephant conflict in the Sravastipura DS division*
1997 to 1999**

Around Nachchaduwa major tank

(i) Human deaths

Year	Total for the year	Village	No/Age/Sex	Remarks
1997	2	Alutwewa	1/43/M	-
		Madawalagma	1/-/M	-
1998	nil	-	-	-
1999	6	Thuruwila	1/53/M	Killed in the field
		Aluthpunchikulama Nachchaduwa	1/-/ 4/47,17,26,5/F,F, M,M (all of one family)	- Killed in the home

Source: Department of Wildlife Conservation, Range Office, Anuradhapura.

(ii) Wild elephant deaths

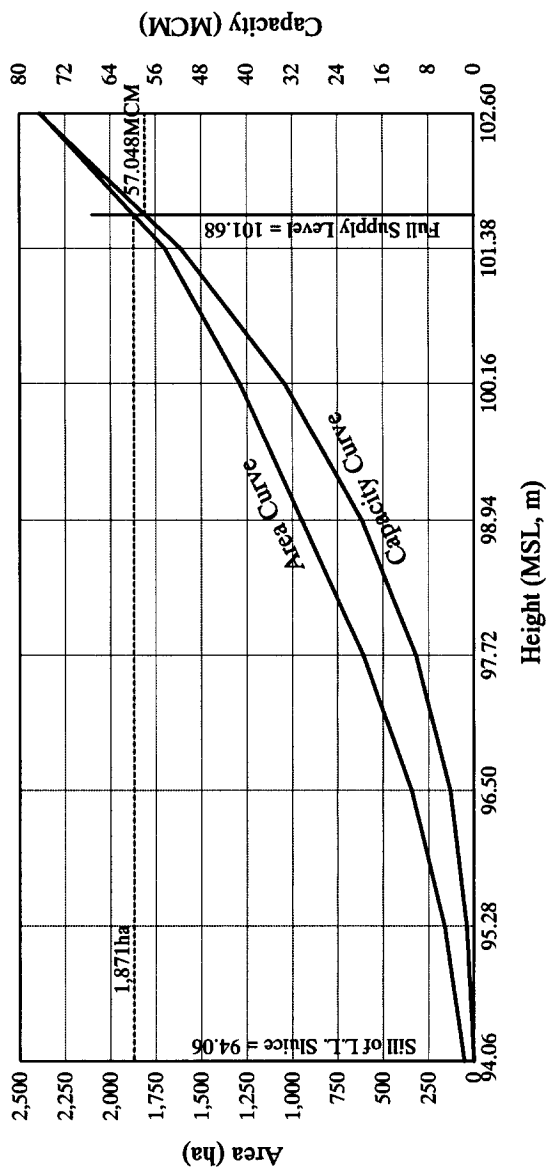
Year	Total for the year	Village	No/Age/Sex	Remarks
1997	Nil			
1998	1	Thuruwila	1/-/-	Gunshot injuries
1999	3	Galkulama	1/-/-	Gunshot injuries
		Ittikulama	1/-/-	Gunshot injuries
		Bulupethawa	1/-/-	Gunshot injuries

Source: Anuradhapura Range Office, Department of Wildlife Conservation.

* This is a newly created Divisional Secretary Division in 1999 by redefining the boundaries of other Divisions. Hence, it has not been possible to obtain all the data, due to the transfer of material from the old offices to the new office had not been completed at the time of the Field Study.

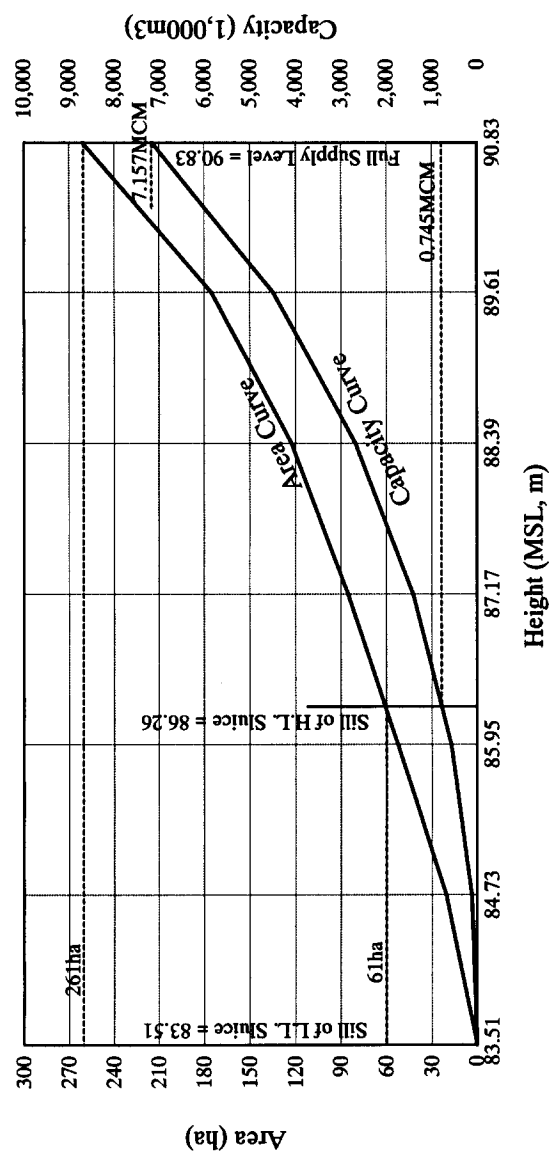
FIGURES

Nachchduwa Tank, Area & Capacity Curve



Height	Area		Capacity	
	(m)	(Acres.)	(ha)	(MCM)
318.60	94.06	135	55	0
312.60	95.28	404	163	1.330
316.60	96.50	848	343	4.418
320.60	97.72	1,508	610	10.230
324.60	98.94	2,342	948	19.728
328.60	100.16	3,190	1,291	27.058
332.60	101.38	4,200	1,700	41.838
333.60	101.68	4,624	1,871	46.250
336.60	102.60	5,896	2,386	62,030

Palukadawea Tank, Area & Capacity Curve



Height	Area		Capacity	
	(m)	(Acres.)	(ha)	(MCM)
274.00	83.52	0	0	0
278.00	84.73	51	21	0.126
282.00	85.95	130	53	0.572
283.00	86.26	150	61	0.745
286.00	87.17	211	85	1.146
290.00	88.39	303	123	2.682
294.00	89.61	433	175	3.646
298.00	90.83	645	261	5.802

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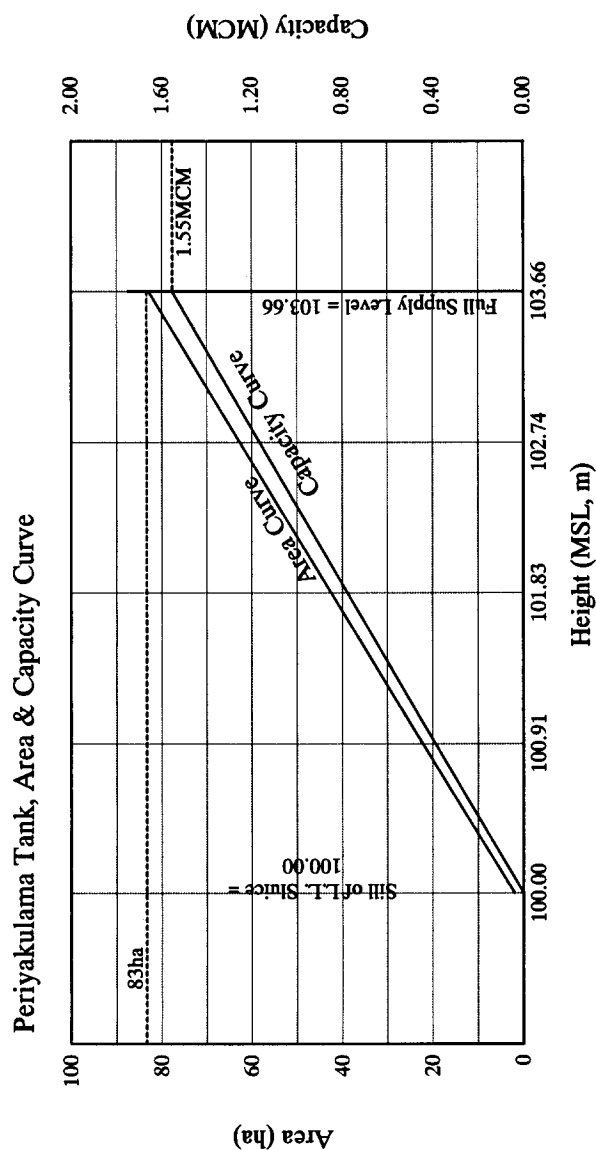
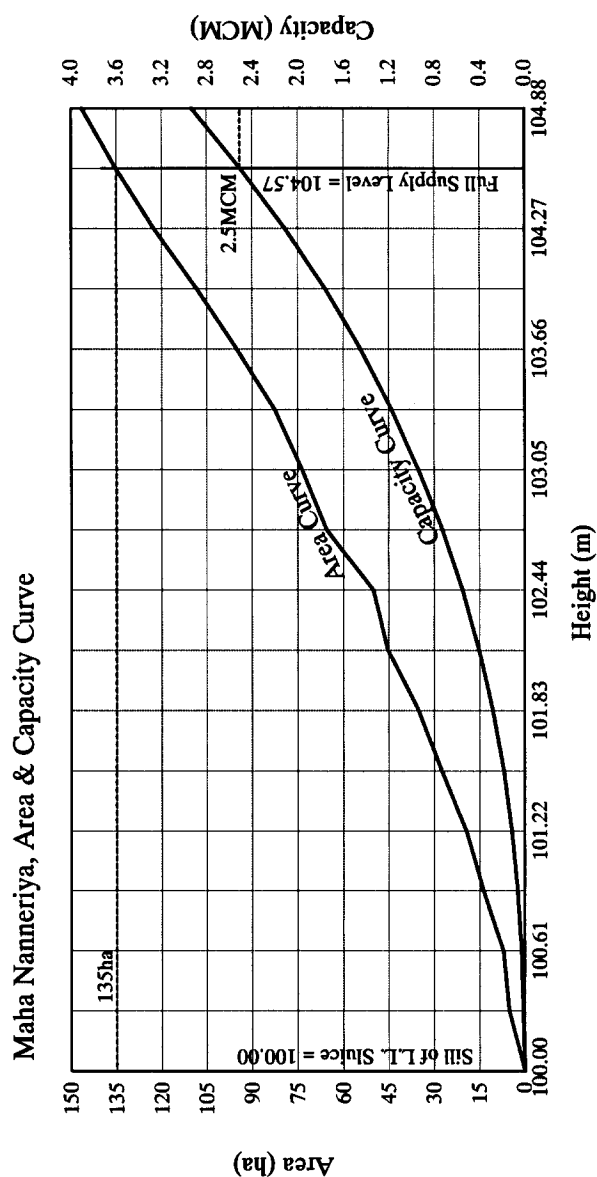
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Figure M 5.1

Tank Area & Capacity Curve, Major Scheme

Height		Area		Capacity
(ft)	(m)	(Ac)	(ha)	(Ac.ft) (MCM)
100.00	100.00	10	4	0 0.00
101.00	100.30	13	5	12 0.01
102.00	100.61	18	7	27 0.03
103.00	100.91	34	14	53 0.07
104.00	101.22	48	19	94 0.12
105.00	101.52	68	28	152 0.19
106.00	101.83	87	35	230 0.28
107.00	102.13	112	45	329 0.41
108.00	102.44	124	50	447 0.55
109.00	102.74	162	66	590 0.73
110.00	103.05	182	74	762 0.94
111.00	103.35	204	83	955 1.18
112.00	103.66	235	95	1,175 1.45
113.00	103.96	268	108	1,426 1.76
114.00	104.27	303	123	1,712 2.11
115.00	104.57	334	135	2,030 2.50
116.00	104.88	362	146	2,378 2.93

Height		Area		Capacity
(ft)	(m)	(Ac)	(ha)	(Ac.ft) (MCM)
100.00	100.00	5	2	0 0.00
112.00	103.66	205	83	1,260 1.55



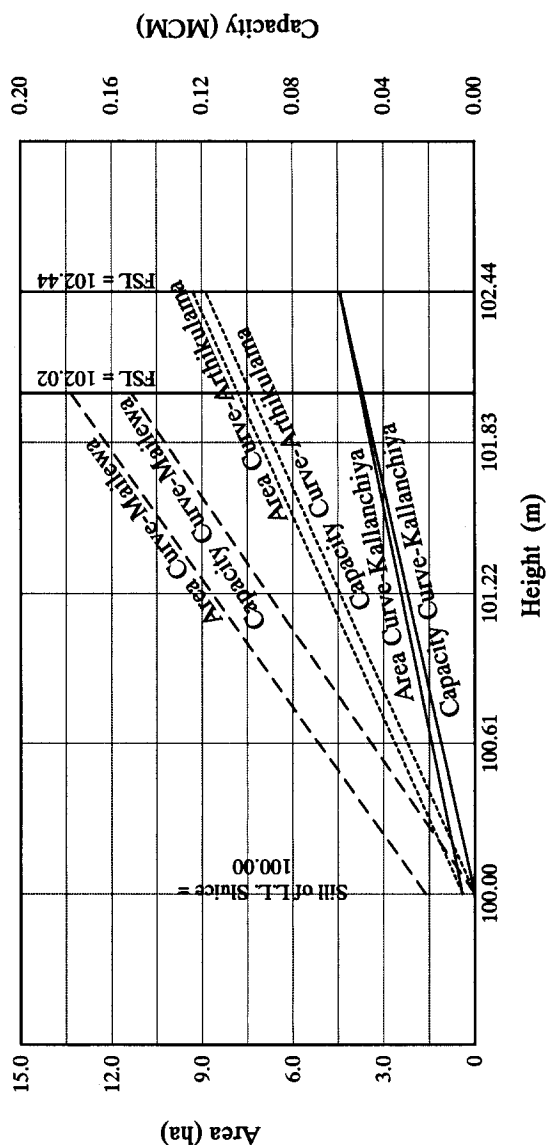
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Figure M 5.2

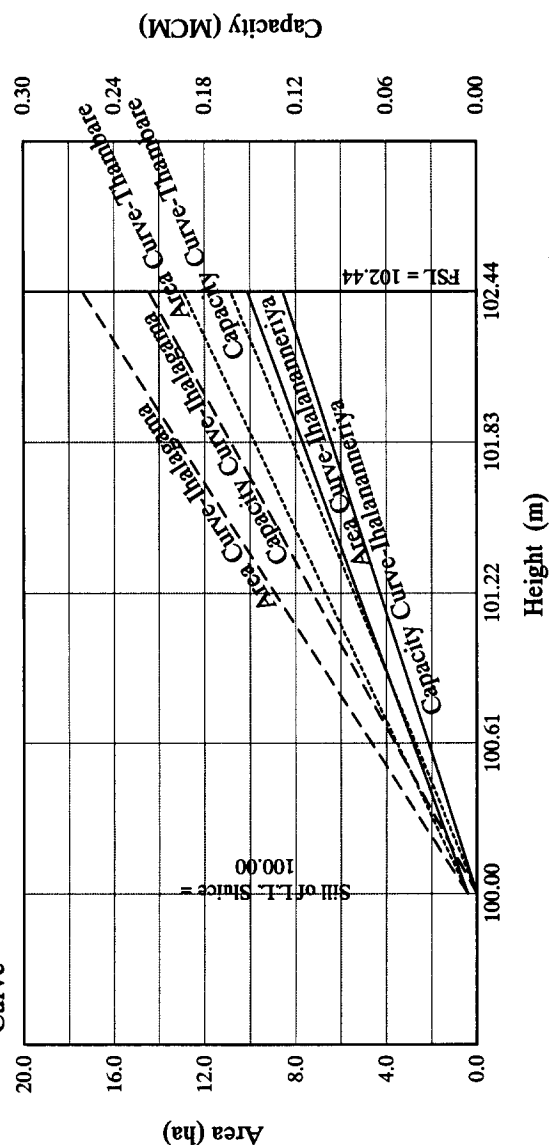
Tank Area & Capacity Curve, Medium Scheme

Kallanchiya, Arthikulama and Mailwa, Area & Capacity Curve



Height		Area		Capacity	
Kallanchiya					
(ft)	(m)	(Ac)	(ha)	(Ac.ft)	(MCM)
100.00	100.00	1	0.4	0	0.000
108.00	102.44	11	4.5	48	0.059
Arthikulama					
(ft)	(m)	(Ac)	(ha)	(Ac.ft)	(MCM)
100.00	100.00	1	0.4	0	0.000
108.00	102.44	23	9.3	96	0.118
Mailwa					
(ft)	(m)	(Ac)	(ha)	(Ac.ft)	(MCM)
100.00	100.00	4	1.6	0	0.000
106.63	102.02	33	13.4	123	0.151

Ihalagama, Thambare and Ihalananneriya, Area & Capacity Curve



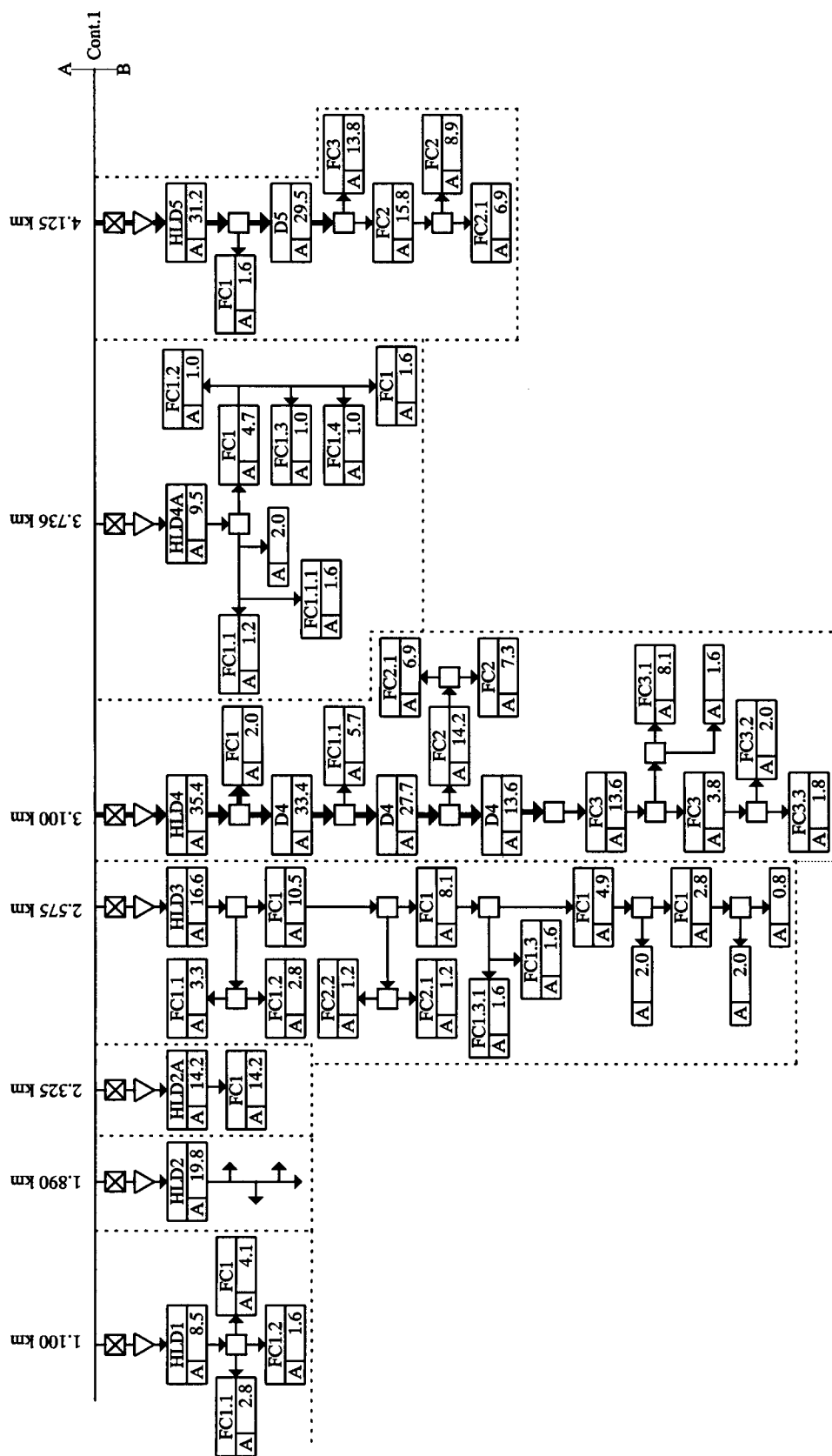
Height		Area		Capacity	
Ihalagama					
(ft)	(m)	(Ac)	(ha)	(Ac.ft)	(MCM)
100.00	100.00	1	0.4	0	0.000
108.00	102.44	43	17.4	176	0.217
Thambare					
(ft)	(m)	(Ac)	(ha)	(Ac.ft)	(MCM)
100.00	100.00	1	0.4	0	0.000
108.00	102.44	32	12.9	132	0.163
Ihalananneriya					
(ft)	(m)	(Ac)	(ha)	(Ac.ft)	(MCM)
100.00	100.00	1	0.4	0	0.000
108.00	102.44	25	10.1	104	0.128

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Figure M 5.3

Tank Area & Capacity Curve, Minor Scheme



Legend

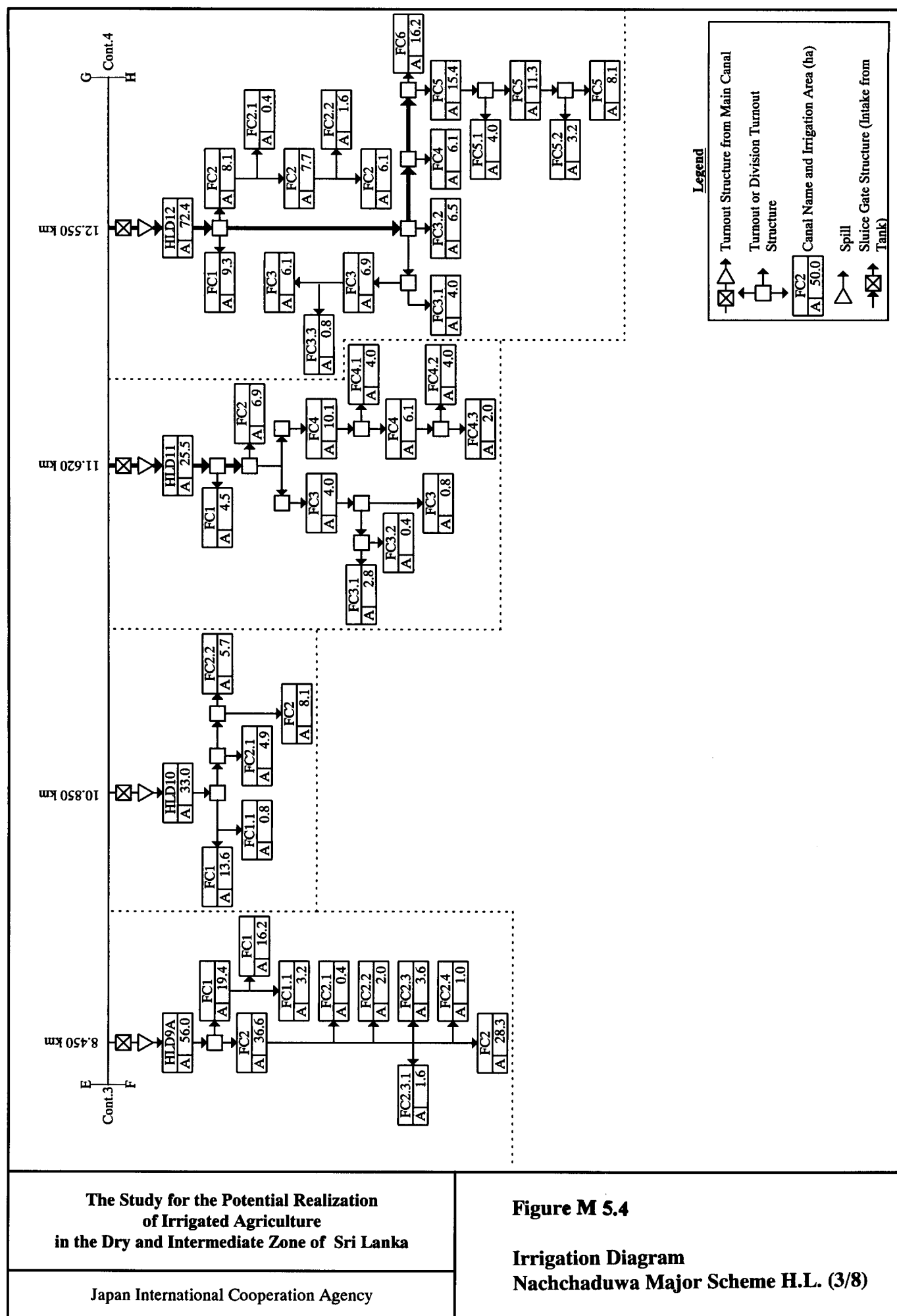
- Turnout Structure from Main Canal
- Turnout or Division Structure
- Canal Name and Irrigation Area (ha)
- Spill
- Sluice Gate Structure (Intake from Tank)

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Figure M 5.4

Irrigation Diagram
Nachchaduwa Major Scheme H.L. (1/8)

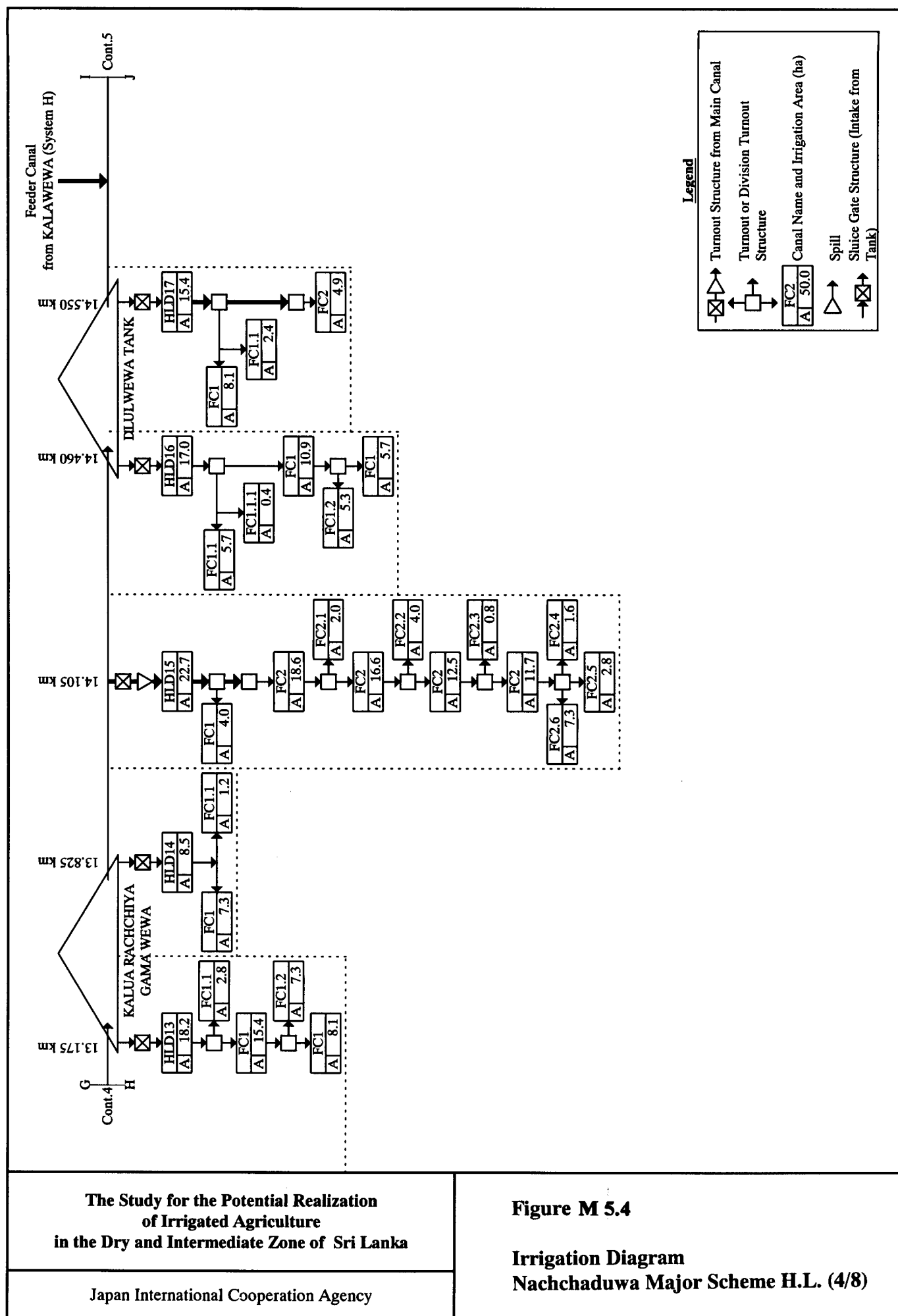


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Figure M 5.4

Irrigation Diagram
Nachchaduwa Major Scheme H.L. (3/8)

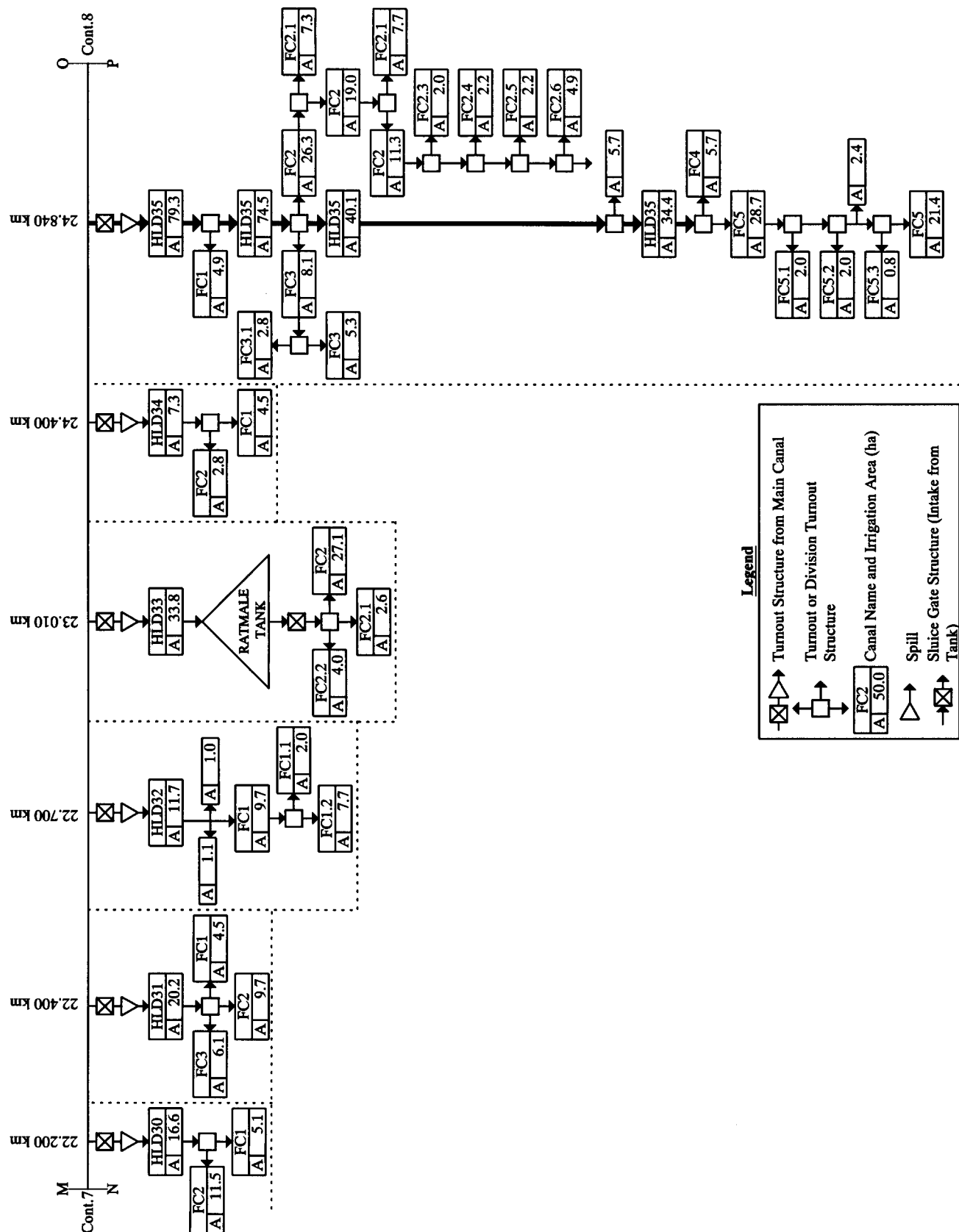


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Figure M 5.4

Irrigation Diagram
Nachchaduwa Major Scheme H.L. (4/8)

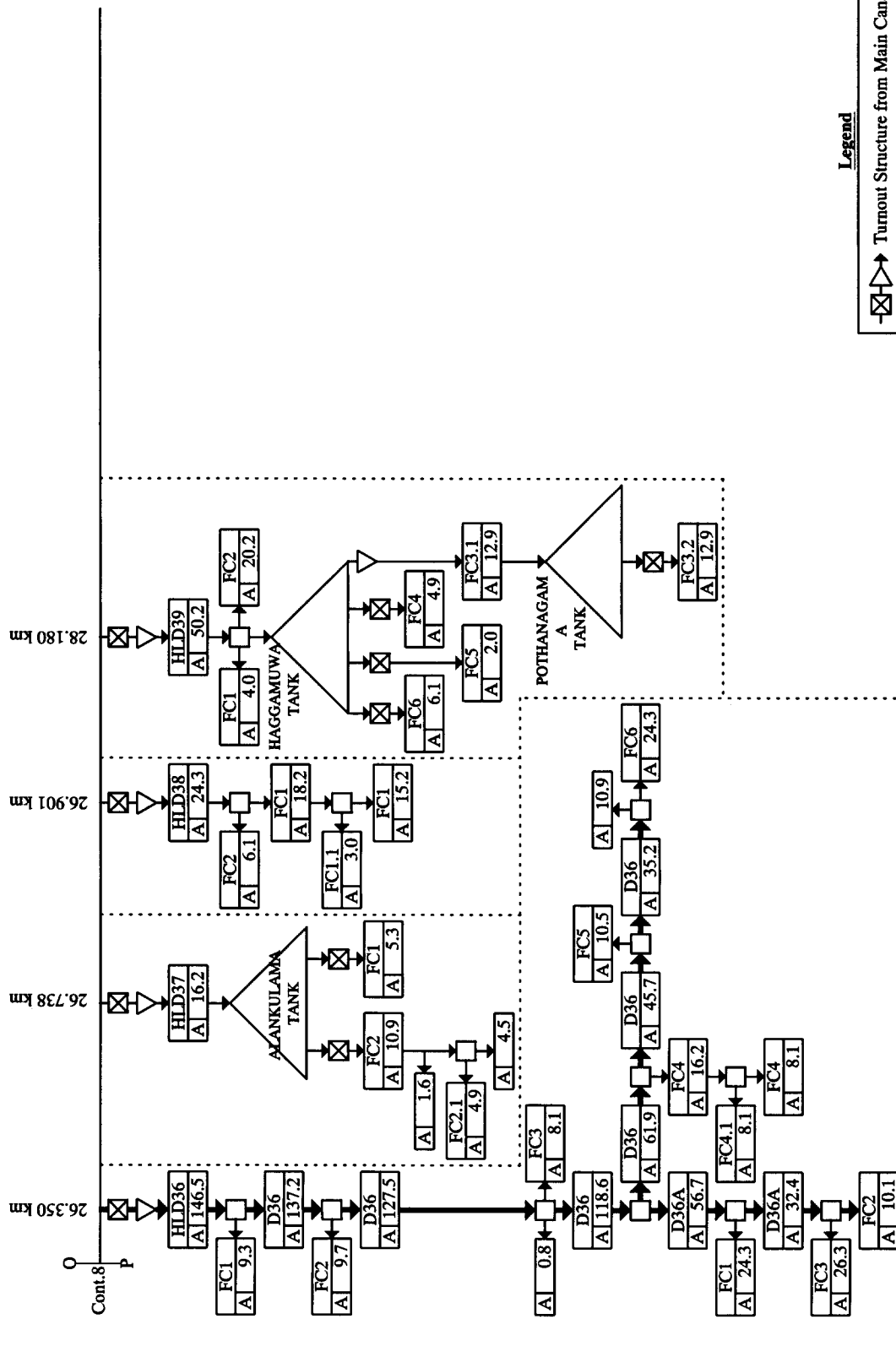


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Figure M 5.4

Irrigation Diagram
Nachchaduwa Major Scheme H.L. (7/8)

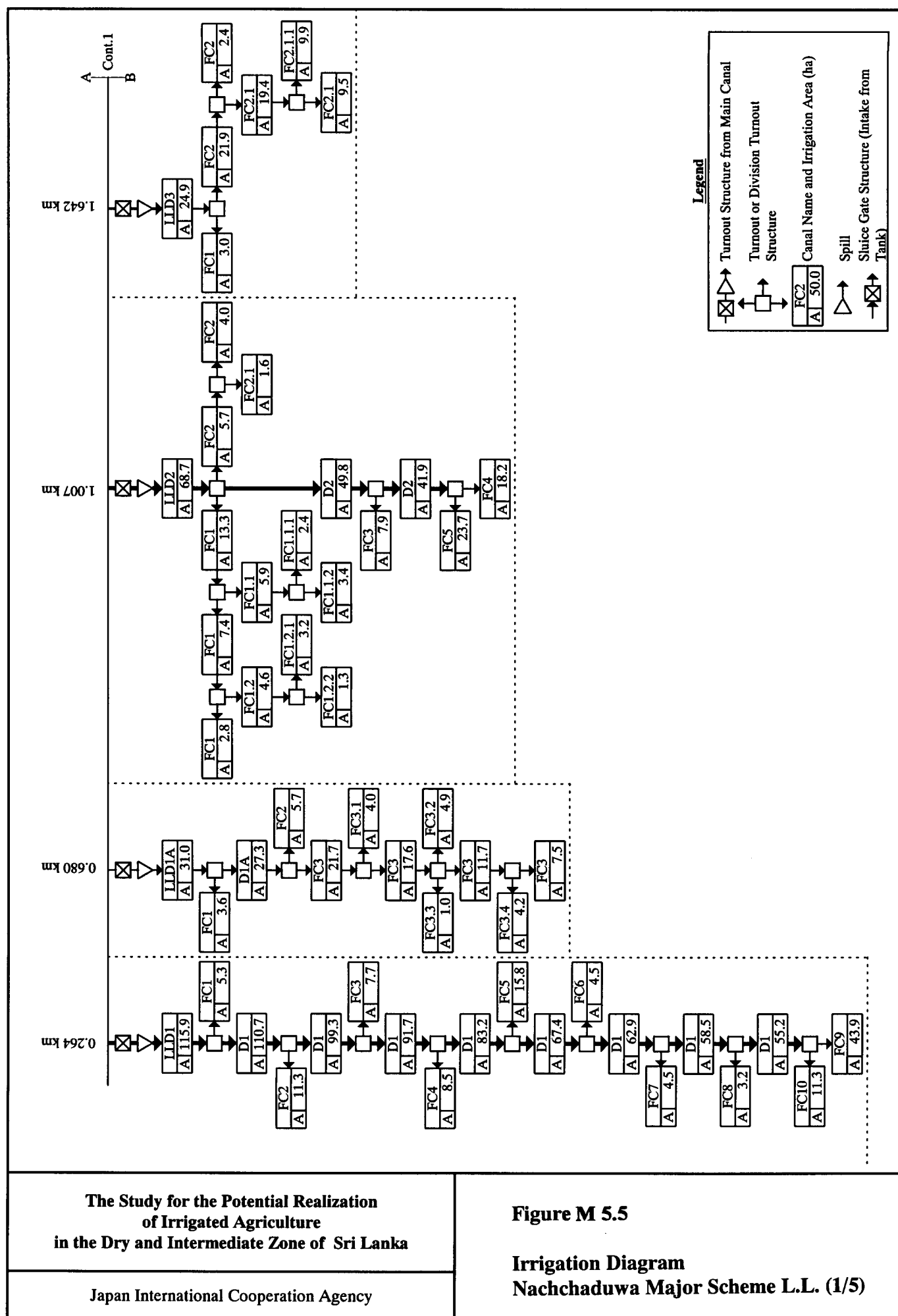


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Figure M 5.4

Irrigation Diagram
Nachchaduwa Major Scheme H.L. (8/8)

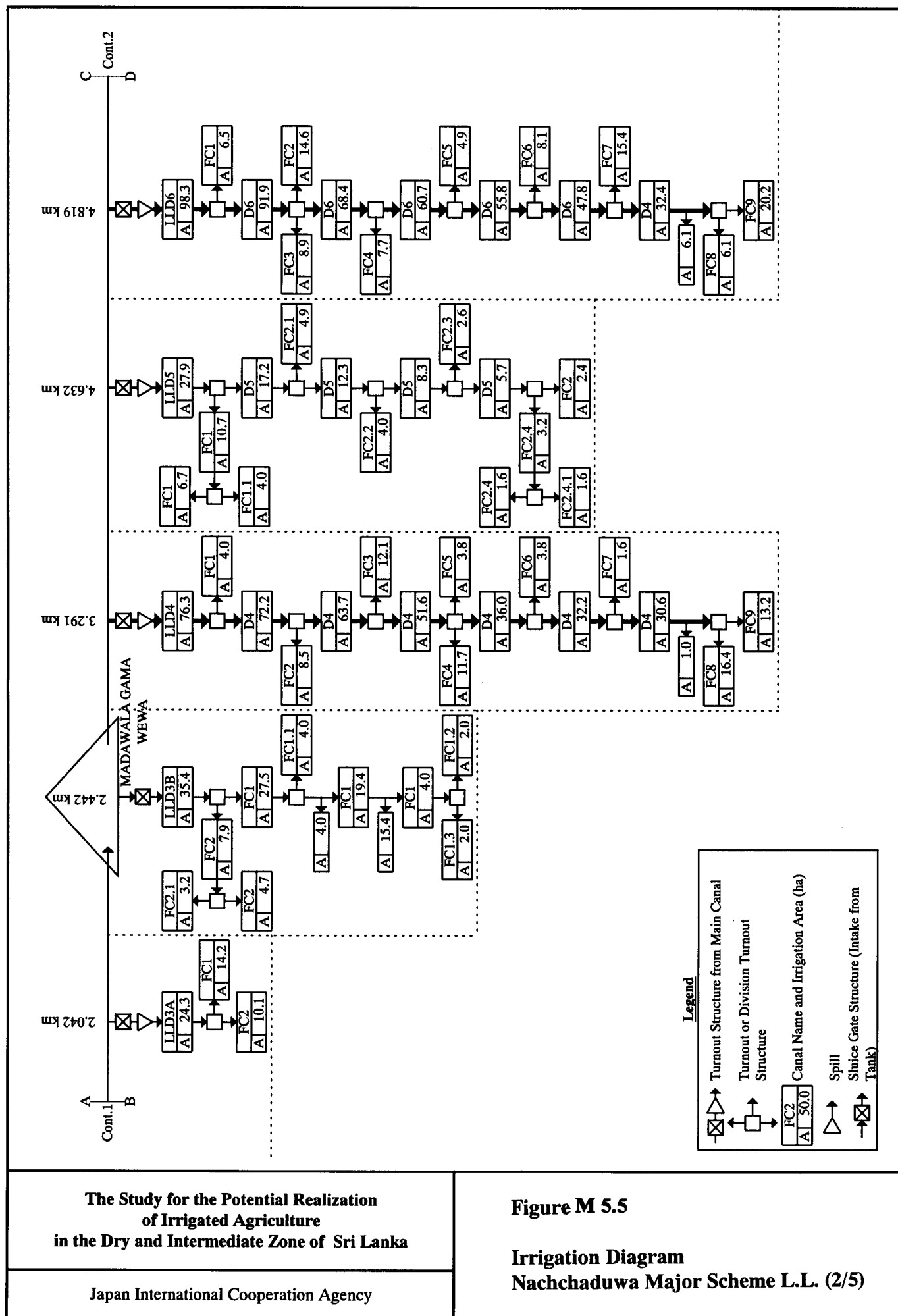


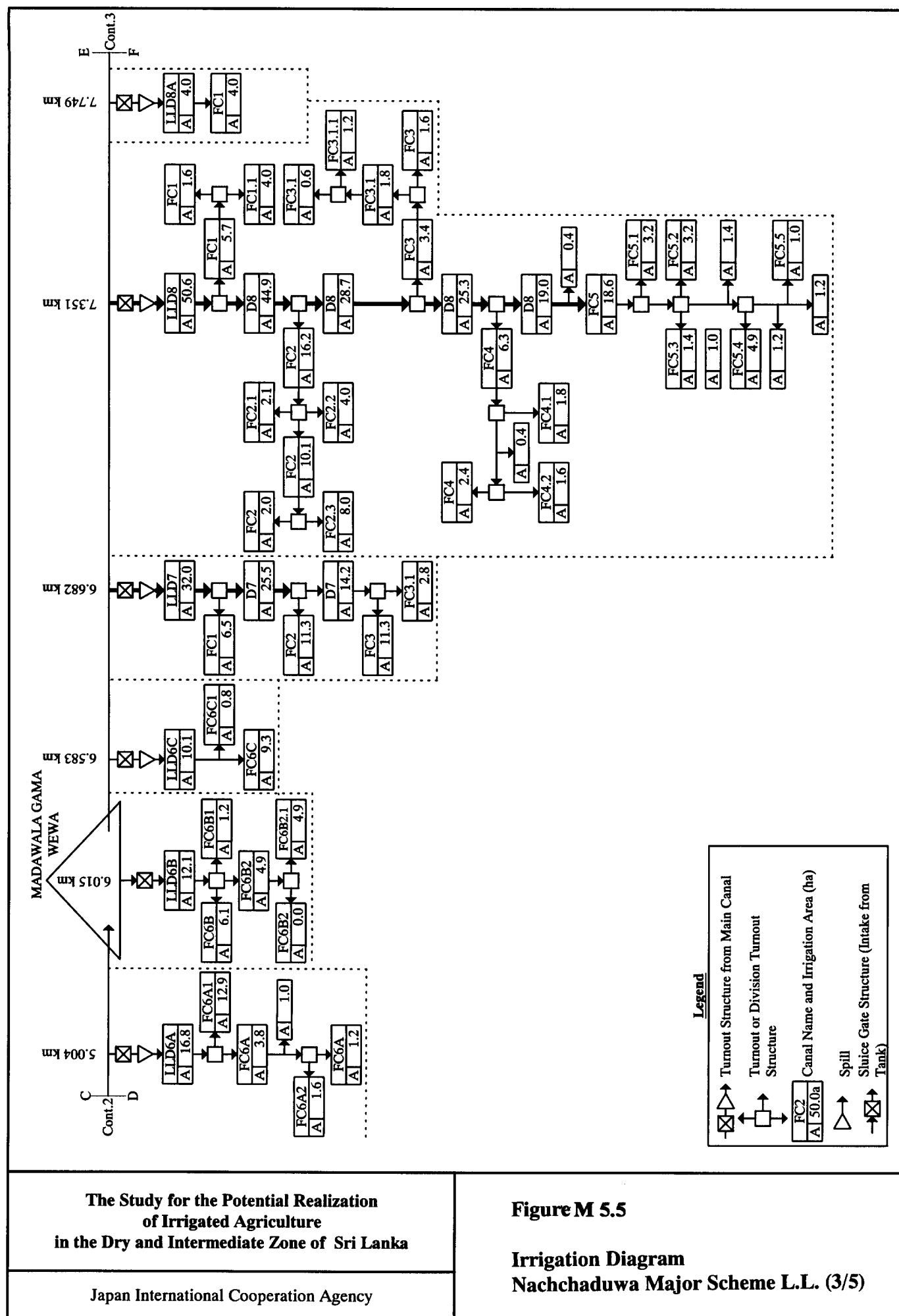
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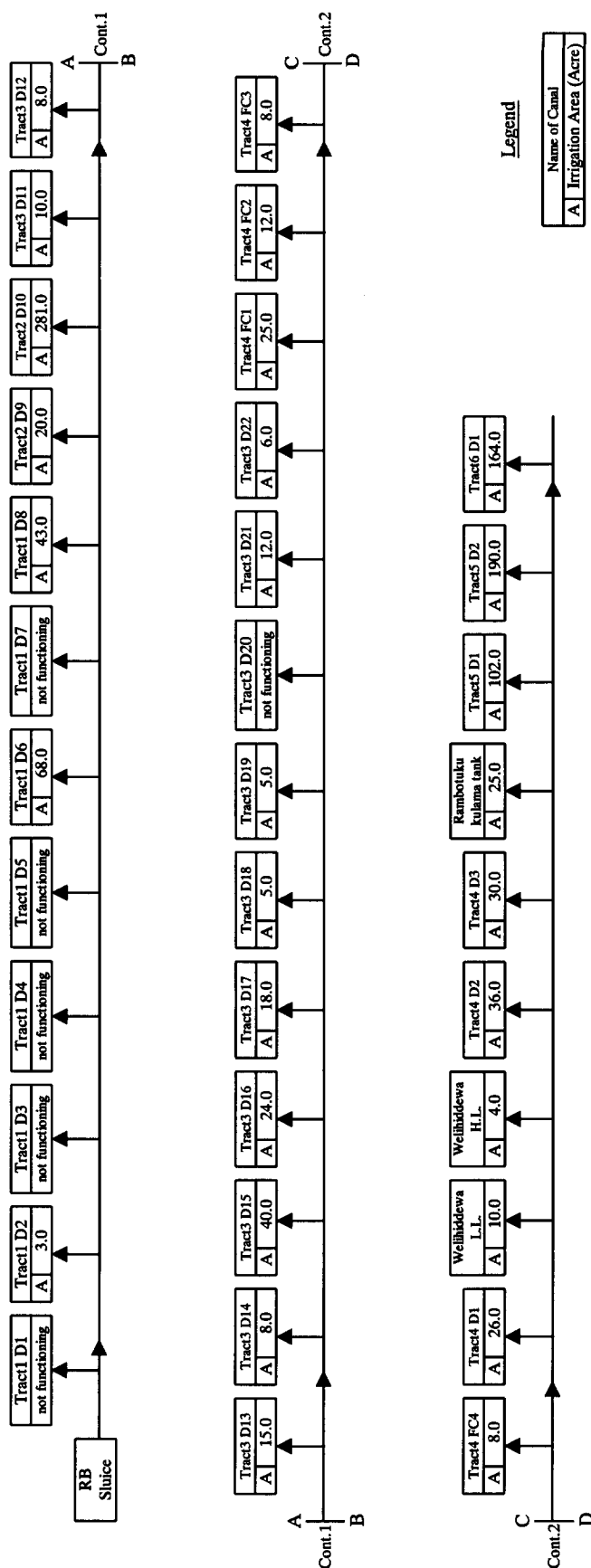
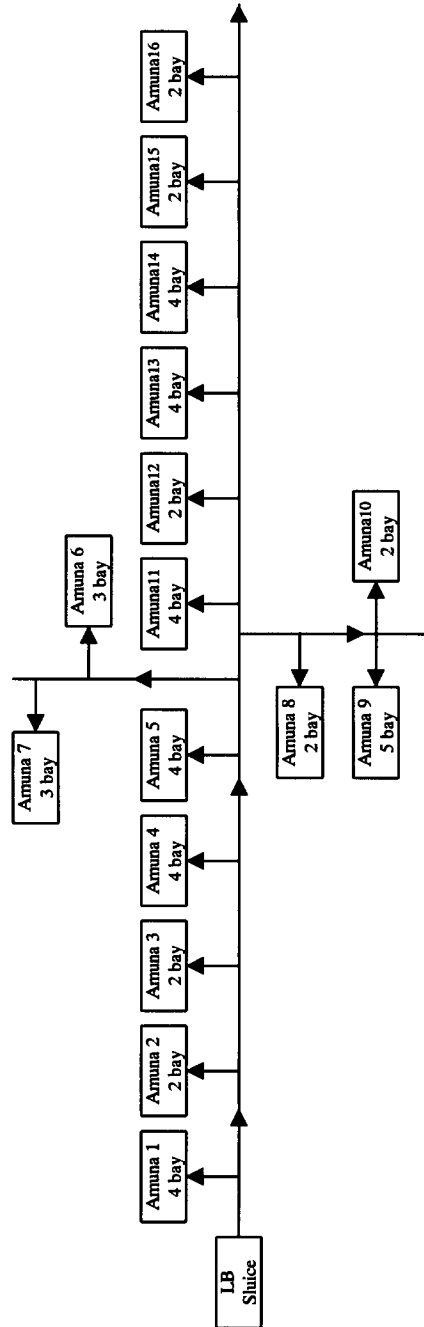
Figure M 5.5

Irrigation Diagram
Nachchaduwa Major Scheme L.L. (1/5)





No.	Name of AMUNA
1	DANGAHA AMUNA
2	ALALOLA AMUNA
3	KOTAEALA AMUNA
4	WEERAGADANA AMUNA
5	WEERAGADANA AMUNA
6	TIBBCTUHENA AMUNA
7	TALAKOLA AMUNA
8	WELI AMUNA
9	WERHENA AMUNA
10	MALGAHA KOTUWA AMUNA
11	KOTUWELA AMUNA
12	HAMILLA KOTUWA AMUNA
13	PALUGAHA KOTUWA AMUNA
14	KARUWALAGAHA AMUNA
15	PURAWELA AMUNA
16	NAWA AMUNA



Legend

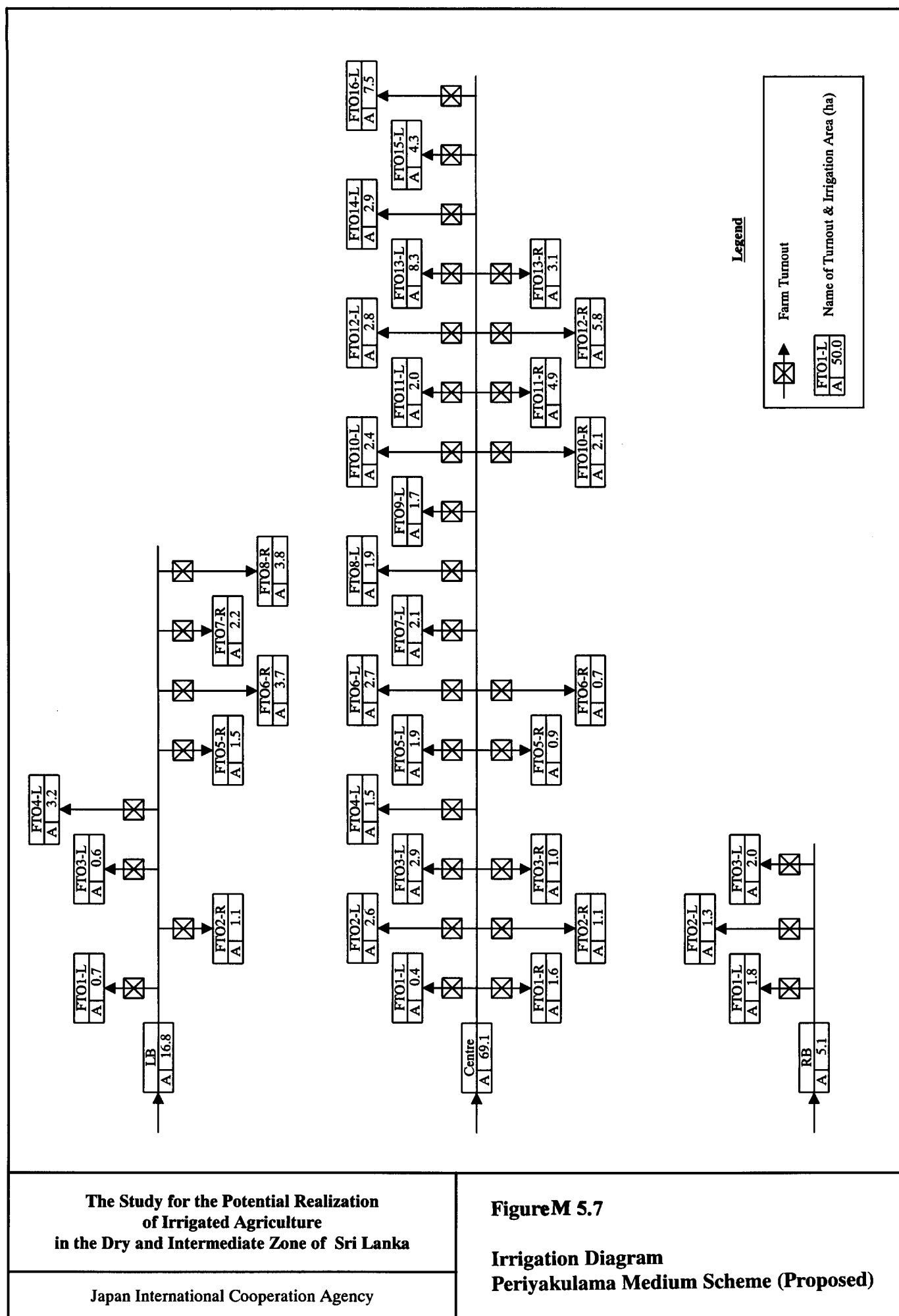
Name of Canal
A Irrigation Area (Acre)

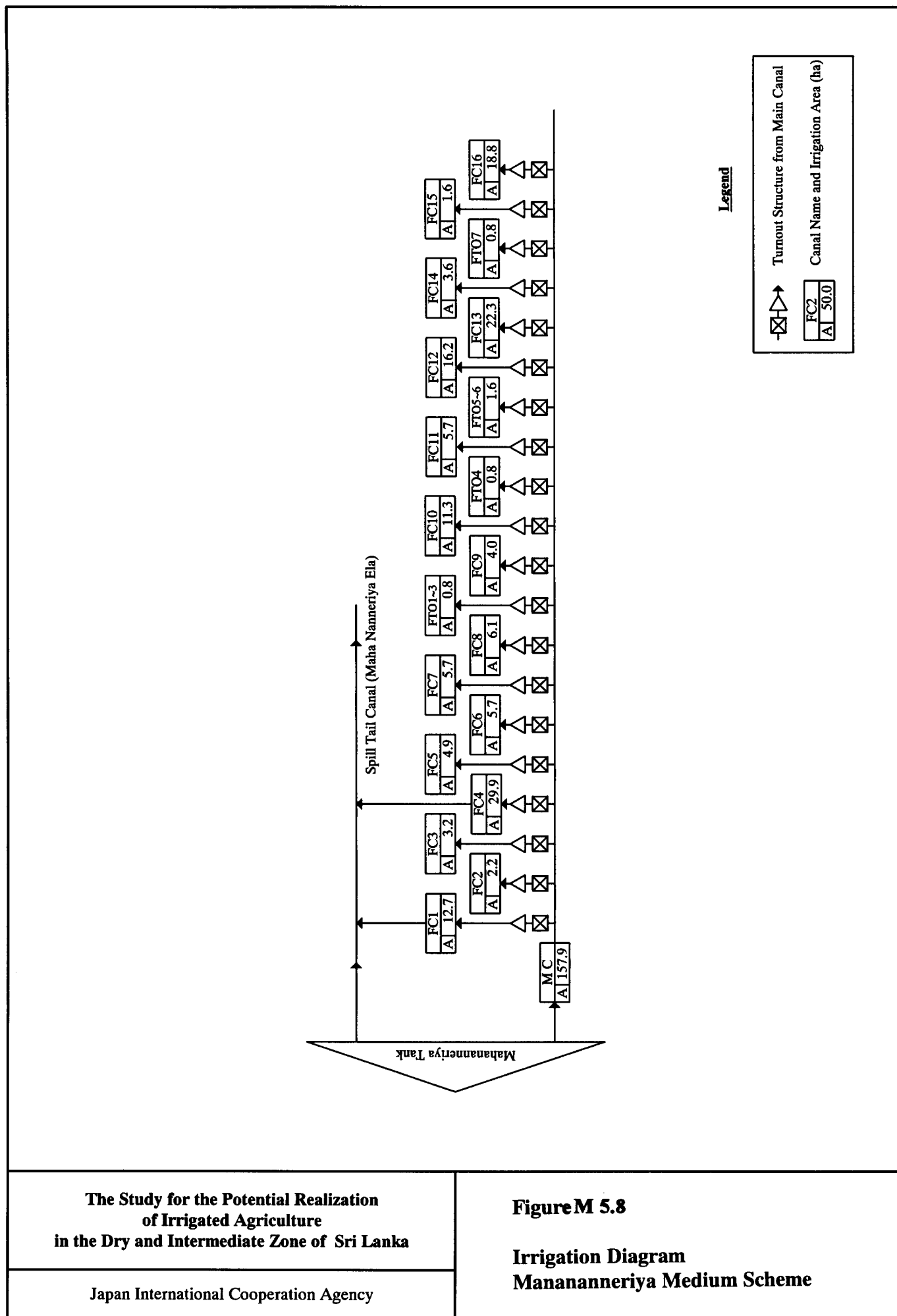
The Study for the Potential Realization
of Irrigated Agriculture
in the Dry and Intermediate Zone of Sri Lanka

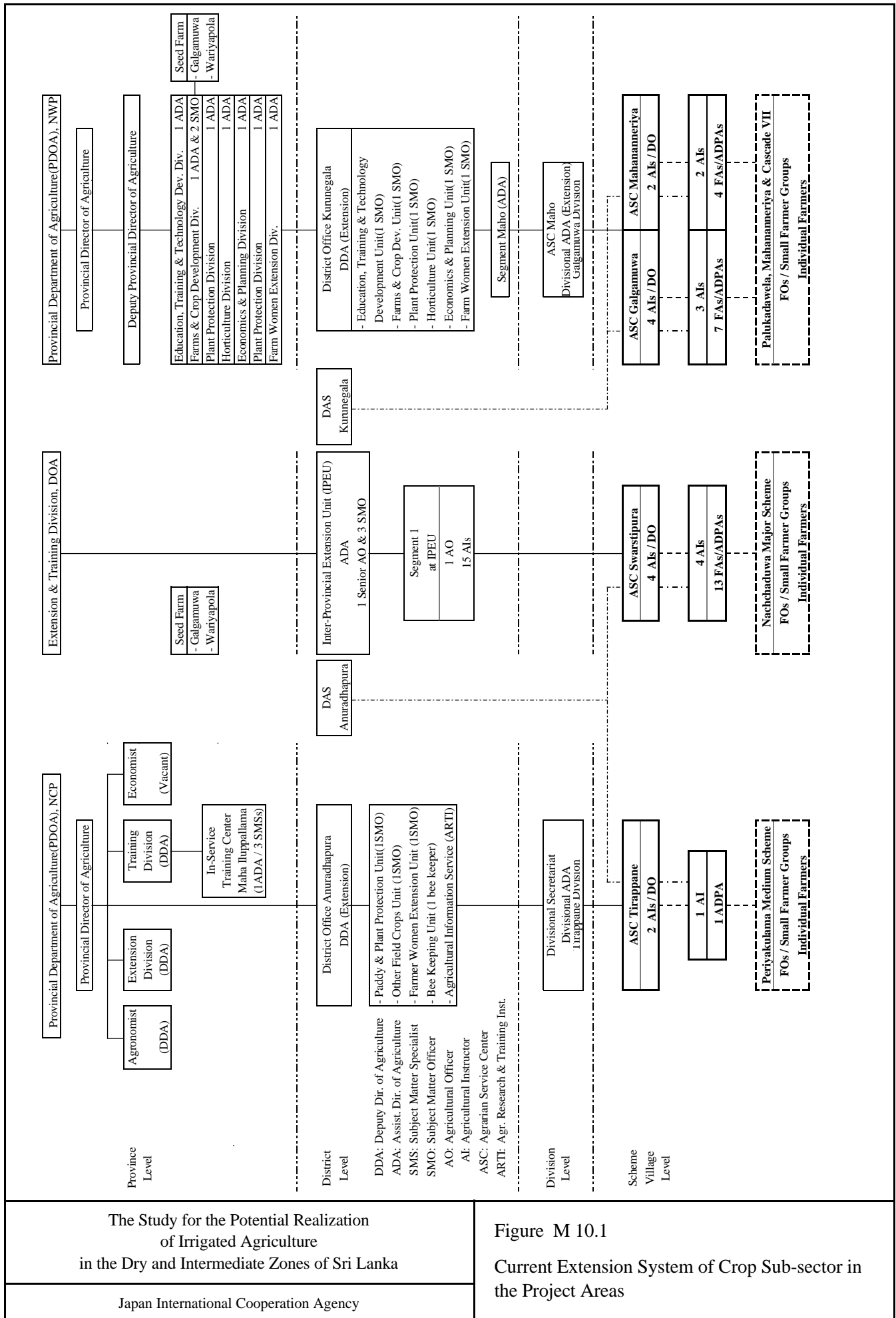
Japan International Cooperation Agency

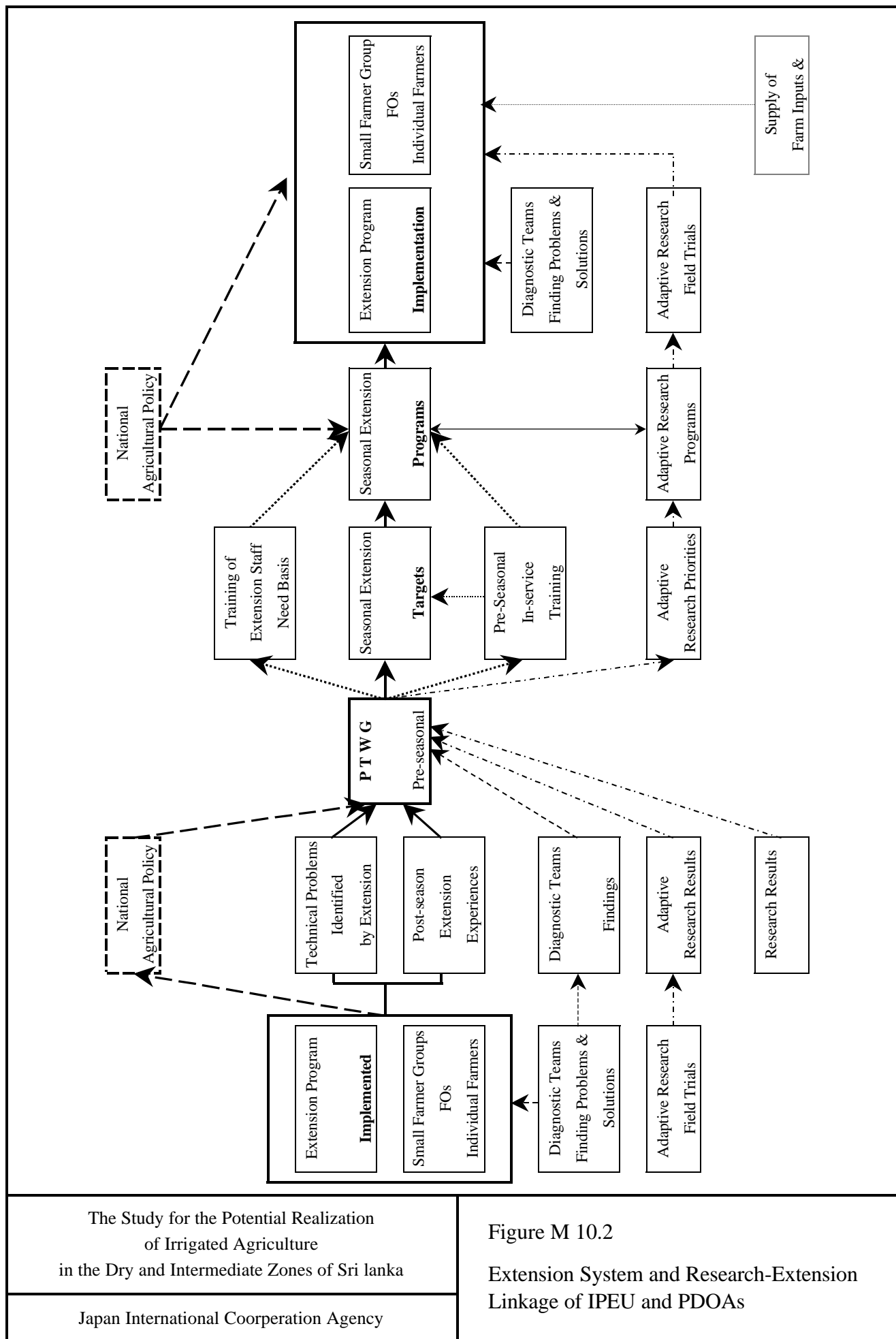
Figure M 5.6

Irrigation Diagram
Palukadawela Major Scheme









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Figure M 10.2
Extension System and Research-Extension
Linkage of IPEU and PDOAs

