The Project Office will work closely with the concerned agencies, and avail its facility and equipment to them in achieving the objectives of the initial phase of the IRDP.

However, other vehicles for operational and extension purposes under the various shemes are to be deployed directly to the concerned agencies. It is considered impractical for these to be deployed at the Project Office given limited scale of the facility, and anticipated confusion in jurisdictions regarding the vehicles.

(3) Location and Status of Project Area

Under the Project, facility sites are scattered at 15 locations throughout the District as shown in Fig-2.

The breakdown is as follows:

①	Morenna:	ATT Center, intensive cropping model farm, drainage improvement model farm and Morenna model irrigation scheme
②	Ambepussa:	Upland model farm under ATT Scheme, Ambepussa DTC
③	Walpita:	MEC seedling center, Walpita DTC
④	Other areas (12):	Storehouse and construction sites under ASS Scheme

(i) ATT Center: Morenna

The site for the center main building, work shop, garage, etc., is in the vicinity of Morenna anicut on government land administered by the Land Reform Committee and the Irrigation Department. The site is about 150m downstream of the point where National Highway A-1 crosses the Attanagalu Oya and corresponds to the most upstream point of the Morenna irrigation area.

(ii) Intensive Cropping Model Farm: Morenna

The site is government land administered by the Land Reform Committee. It is currently farmed by 16 farm households. Area is 2.1ha (5.3ac) at the upstream portion of the Morenna irrigation area. Diversion is from the middle channel of the Morenna anicut. The area is already paddy fields.

(iii) Improved Drainage Model Farm: Morenna

The farm has a tower for direct diversion from the Attanagalu Oya. Area is 3.5ha (8.7ac) of privately owned land. It is farmed by 22 farm households and is already paddy fields.

(iv) Morenna Model Irrigation Scheme: Morenna

The area is 390ha and is privately owned by 836 households. Irrigated agriculture has been performed in the area since the construction of the Morenna anicut in 1943. The area is already paddy fields; however, there are no farm roads.

(v) Upland Crops Model Farm: Ambepussa

The site is on government land administered by the Seed Section of the Agricultural Department of the Ministry of Agricultural Development and Research. Area is 5.8ha (14.5ac). Diversion from the Maha Oya is planned under the scheme since there are no irrigation facilities. Topography is slightly undulating.

(vi) Ambepussa DTC: Ambepussa

Building construction and rehabilitation of water use facilities will be performed under the scheme. The building site is level. Power is available; however, since service water is not, a well is planned.

(vii) Minor Export Crop Seedling Center: Walpita

The site is on government land administered by the Minor Export Crop Department of the Ministry of Agricultural Development and Research. Area is 5.0ha (12.5ac). Topography is gently dipping flatland. The land is at present largely unutilized, although some palm trees have been planted. Power is available nearby. Water source is a well.

(viii) Walpita DTC: Walpita

Building construction and rehabilitation of irrigation facilities and domestic water supply facilities are to be performed under the scheme. Building site is leveled land. Although power is available, water service is not. The training farm is divided between two locations. The portion nearest the front entrance is level farmland. The other portion is located at the rear of the DTC building and is slightly dipping flatland.

(ix) Storehouses: 12 sites: Mirigawa, Marandagahamula, Andiambalama, Mabodala, Nittambuwa, Gampaha, Ja-Ela, Urapola, Mudungoda, Udupila, Delgoda, Bemmulla

Sites are at Agrarian Service Centers. Most sites are already leveled land.

(4) Facilities and Equipment

Scale and function of facilities and equipment for each scheme are outlined in the following table.

TABLE 4-3 DESCRIPTION OF FACILITIES AND EQUIPMENT

Scheme	Facilities/Equipment	Scale/Specifications	Function
Agricultural Technology Transfer Scheme	Intensive cropping model farm	2.1ha of paddy in Morenna	Model farm for intensive cultivation in paddy fields. Cultivation of upland crops, vegetables in addition to paddy.
	Upland crops model farm	5.8ha of upland at Ambepussa	Model farm for intensive cultivation of upland crops. Cultivation of upland crops, vegetables.
	Improved drainage model farm	3.5 ha of paddy at Morenna	Effect of improved drainage on production of rice.
	ATT Center main building	760m², 2 story building at Morenna	Direct management of paddy and upland model farms, and technical guidance for improved drainage model farm. Extension of new cropping technology. To be run by agricultural experts. Repair and maintenance of farm machinery.
	Workshop at above	162m², with equipment, at Morenna	Repair and maintenance of farm machinery.
	Ambepussa farm office	54m², at Ambepussa	Operation and management of upland crops model farm.
	Shed	50m², at Ambepussa	For farm work requiring protection from rain such as fertilizer mixing, etc.
	Drying yard	500m² at Morenna 100m² at Ambepussa	Crop drying after harvest
	Upland crops model farm irrigation facilities	5.8ha at Ambepussa Pump: ø75mm × 14kw × 1unit Main pipe: ø100mm × 510m Distribution pipe: ø4mm × ?m	Diversion from Maha Oya by pump to water tower. Distribution by pipe. Tower capacity: 75m³
	Farm machinery		
	1. 4w tractor (2 units)	40hp, with trailer (3t) and attachments	Plowing and transport
	2. 2w tractor (2 units)	12.5hp, with trailer (3t) and attachments	Plowing and transport
	3. Rice planter		Transplant of rice seedlings in MMI area

Scheme	Facilities/Equipment	Scale/Specifications	Function
	4. Sprayer	Automatic, backpack type: 6 gallons x 4 units Hand powered backpack type: 3.8 gallons x 4 units	Application of agro-chemicals
	5. Others	1 wheelbarrow, scales, etc.	General farm work
	Vehicles		
	1. Jeep (4 units)	Pajero type	Mobility
	2. Motorbike	90cc	Mobility
	Equipment for extension/office work		
	1. Copy machine (1 unit)	FX-3950 type	Copying of materials for distribution
	2. Typewriter, English and Singhalese (1 unit each)		Preparation of materials, reports
	3. AV equipment		
	overhead projector	Uchida IP285 type	
	TV and video	20" color, PAL mode	
	Slide projector		
	Soil test equipment (1 set)	Soil auger, sampling kit, etc.	Soil survey and analysis
Morenna Model Irrigation Project	Morenna anicut rehabilitation	3.6m x 1 gate + 2.1m x 4 gates	Raising of crest at right bank and middle channel intake. Gates to be rehabilitated for easy operation during floods. Improved water management on Attanagalu

Scheme	Facilities/Equipment	Scale/Specifications	Function
	Palu Oya anicut rehabilitation	1.8m × 2 gates	Raising of crest at left bank intake. Gates to be rehabilitated for easy operation during floods. Improved water management on Attanagalu
	Right bank canal rehabilitation	Main canal: Q = 0.585-0.118m³/s, L = 3,450.0m Branch canal: L = 2,730.5m	Suitable water management for Morenna area
	Middle channel canal rehabilitation	Main canal: Q = 0.084-0.040m³/s, L = 3,100.0m Branch canal: L = 800.0m	Suitable water management for Morenna area
	Right bank canal rehabilitation	Main canal: Q = 0.331-0.138m³/s, L = 3,100.0m Branch canal: L = 800.0m	Suitable water management for Morenna area
	Drainage canal rehabilitation	L = 2,450	Drainage improvement
	Vehicles		
	1. 2w tractor (1 unit)	12.5hp, with trailer	Transport of equipment for O/M of canals
	2. Motorbike (2 units)	90cc	Water management work
	3. Jeep (1 unit)	Pajero type	Water management work
Minor Export Crop Promotion Scheme	Seedling Production Center office	171m², at Walpita	Operation and management of seedling center
	Seedling beds	20m × 1m × 6 rows × 34 houses, shade net, 4,080m²	Seedling production
	Seed farm	1.23ha	Demonstration of mixed cropping and tight cropping of coffee, pepper, etc.
	Sheds	150m² × 2 houses	For preparation of seedling bed soil and mixing of fertilizer
	Greenhouse	4m × 8m = 32m², 1 house, glass	Seedling production and pest control
	Drying yard	10m × 20m × 2 surfaces = 400m²	Post harvest drying of coffee, pepper, etc.

Scheme	Facilities/Equipment	Scale/Specifications	Function
	Irrigation facilities	Well, pump, tower, pipeline, etc.	Irrigation for seedling beds, seed farm, mixed cropping farm, and water supply to buildings
	Farm Machinery		
	1. 4w tractor (2 units)	40hp, with trailer (3t) and attachments	Plowing and transport
	2. 2w tractor (2 units)	12.5hp, with trailer (3t) and attachments	Plowing and transport
	3. Sprayer	Automatic, backpack type: 6 gallons Hand powered backpack type: 3.8 gallons	Application of agro-chemicals
	Office equipment		
	1. Copy machine (1 unit)		Copying of materials
	2. Typewriter, English and Singhalese (1 unit each)		Preparation of materials and reports
	3. O/H projector		Teaching and extension activities
	Vehicles		
	1. Jeep (1 unit)	Pajero type	Mobility
	2. Pick-up	4WD	Transport of materials and seedlings
	3. Truck (2 units)	3.5t	Transport of materials and seedlings
	4. Motorbike	90cc	Mobility
Scheme for Improvement of Agricultural Supporting System	Fertilizer storehouse (6 units)	40t	General storage
	Seed storehouse (8 units)	40t	General storage
	Hauling vehicle		

Scheme	Facilities/Equipment	Scale/Specifications	Function
	1. Truck (2 units)	5.0t	For hauling agro-chemicals, fertilizers, seeds from central storehouse to various ASC's
	2. 2W tractor	with trailer	For hauling agro-chemicals, fertilizers, seeds from ASC's to each farmer
	Staff vehicles		
	1. Jeep (3 units)		For extension activities
	2. Pick-up (5 units)		For extension activities
	3. Motorbike (26 units)	90cc	For extension activities
	Farm equipment		
	Sprayer	Automatic, backpack type (52 units)	Agro-chemical spraying, lending to farmers
		Manual, backpack type (130 units)	Agro-chemical spraying, lending to farmers
Scheme for Improvement of Agricultural Training System			
① Ambepussa DTC	Workshop	162m², with equipment	Maintenance and repair of farm machinery
	Water supply	Well, conveyance pipe	Domestic water supply to existing facilities
	Farm machinery		
	1. 4W tractor (2 units)	40hp, with trailer and attachments	Plow training
	2. 2W tractor (2 units)	12.5hp, with trailer and attachments	Plow training
	3. Sprayer	Automatic, backpack type (6 gal. × 2 units)	Training in application of agro-chemicals
		Manual, backpack type (3.8 gal. × 5 units)	
	Horticultural equipment	Horticultural knife, mower	Training

Scheme	Facilities/Equipment	Scale/Specifications	Function
	Carpentry equipment	Plane, saw, vice, hammer	Training
	Teaching equipment		
	1. O/H projector	1 unit	Instruction
	2. TV and video	20" color, PAL mode	Instruction
	3. Slide projector	1 unit	Instruction
	Seed storage equipment	Refrigerator, etc.	Seed preservation
	Office equipment		
	Copy machine (1 unit)		Copying of materials
	Vehicle		
	1. jeep (1 unit)	Pajero	Mobility
	2. Motorbike (1 unit)	90cc	Mobility
② Walpita DTC	Workshop	162m², with equipment	Maintenance and repair of farm machinery
	Water supply	Well, conveyance pipe	Domestic water supply to existing facilities and to training farm
	Farm machinery		
	1. 4W tractor (1 unit)	40hp, with trailer and attachments	Plow training
	2. 2W tractor (1 unit)	12.5hp, with trailer and attachments	Plow training
	3. Sprayer	Automatic, backpack type (6 gal. × 2 units) Manual, backpack type (3.8 gal. × 5 units)	Training in application of agro-chemicals
	Horticultural equipment	Knife, mower, soil testing kit, ladder, etc.	
	Teaching equipment		
	1. O/H projector	1 unit	Instruction

Scheme	Facilities/Equipment	Scale/Specifications	Function
	2. TV and video	20" color, PAL mode	Instruction
	3. Slide projector	1 unit	Instruction
	Seed storage equipment	Refrigerator, etc.	Seed preservation
	Office equipment		
	Copy machine (1 unit)		Copying of materials
	Home science teaching equipment	Sewing machine (manual), electric oven, etc.	Instruction
	Lab equipment	Soil testing kit, moisture meter, etc.	Instruction
	Vehicle		
	1. jeep (1 unit)	Pajero	Mobility
	2. Motorbike (1 unit)	90cc	Mobility
Project Office	Staff Vehicles		
	1. Minibus (2 units)	26 capacity	Extension activities, transport of farmers to various facility sites
	2. Jeep (2 units)	Pajero type	PO staff mobility
	3. A/V car (1 unit)	Panel van, O/H projector, white board, 16mm projector, etc.	Extension
	Office equipment		
	1. Copy machine		Copying of material
	2. Typewriter, English and Singhalese (1 of each)		Preparation of materials and reports

4-4 Operation and Maintenance Plan

The Project is one priority project under a larger IRDP. To date 15 such projects have been totally or almost completed in Sri Lanka, and the format for administering the operation and maintenance of these projects is well institutionalized. The Regional Development Division of the Ministry of Policy Plan ning and Implementation, the agency responsible for the Project, is considered to have ample experience in this regard.

Agencies directly concerned with the Project are as follows:

National level:
- -Regional Development Division of the Ministry of Policy Planning and Implementation
- -Agricultural Department of the Ministry for Agricultural Development and Research
- -Agrarian Services Department of the Ministry for Agricultural Development and Research
- -Minor Export Crop Department of the Ministry for Agricultural Development and Research
- -Agricultural Development Agency of the Ministry for Agricultural Development and Research

State level:
- -Chief Secretary, Western Province

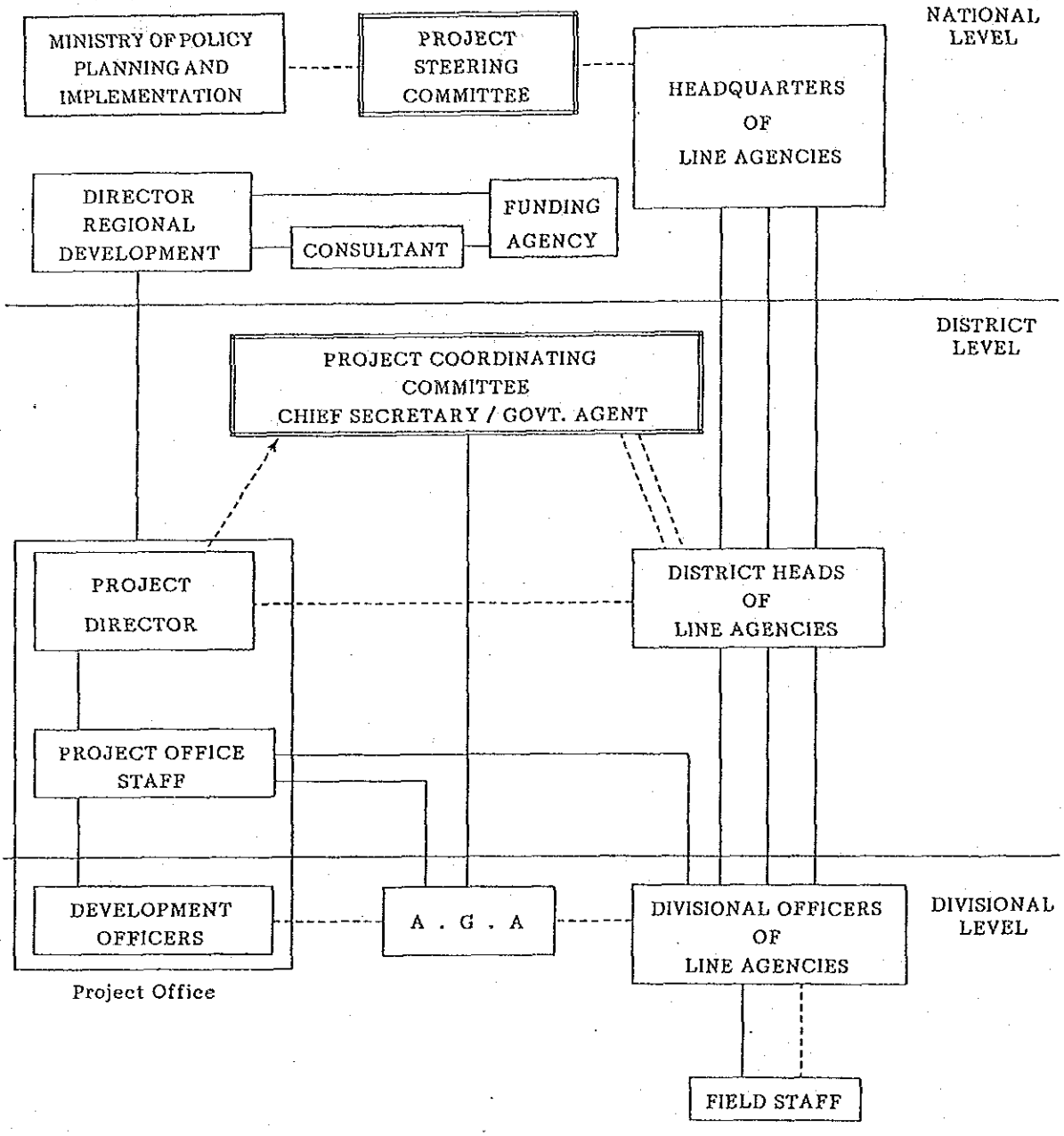
District level:
- -Gampaha District Government Agent
- -Gampaha District Agricultural Committee
- -Western Province and Gampaha district offices of the various national level agencies listed above

In order to coordinate the activities of the above, the following will be established:

National level:
- -Project Steering Committee (chaired by the Assistant Secretary of the Ministry of Policy Planning Implementation and directed by the head of the Regional Development Division)

District level:
- -Project Coordinating Committee (chaired by the District Governor or Chief Secretary of Western Province, and directed by the Project Director)

Fig. 4-2 Organizational Chart



4-4-1 Project Office

The implementing agency within Gampaha District for the IRDP is the Project Office. At the district level, the PO plans, implements (including O/M), monitors and evaluates the projects and schemes under the IRDP. Towards this end, the Project Director is the district representative for the Regional Development Division, and serves as the director for the IRDP coordinating committee. Directors of Gampaha offices for other concerned agencies under the IRDP operate within the jurisdiction of the Project Director.

The Project Director establishes the following 4 units:

1. Planning and Programming Unit
2. Coordination and Implementation Unit
3. Monitoring and Evaluation Unit
4. Accounting Unit

Officials of the PO are employees of the Regional Development Division already assigned to the Gampaha IRDP.

Fig. 4-3 shows the relationship between PO and the various schemes under the Project. Fig. 4-4 shows the organization of the PO.

Fig. 4-3 Relationship Between PO, ATT and Other Schemes

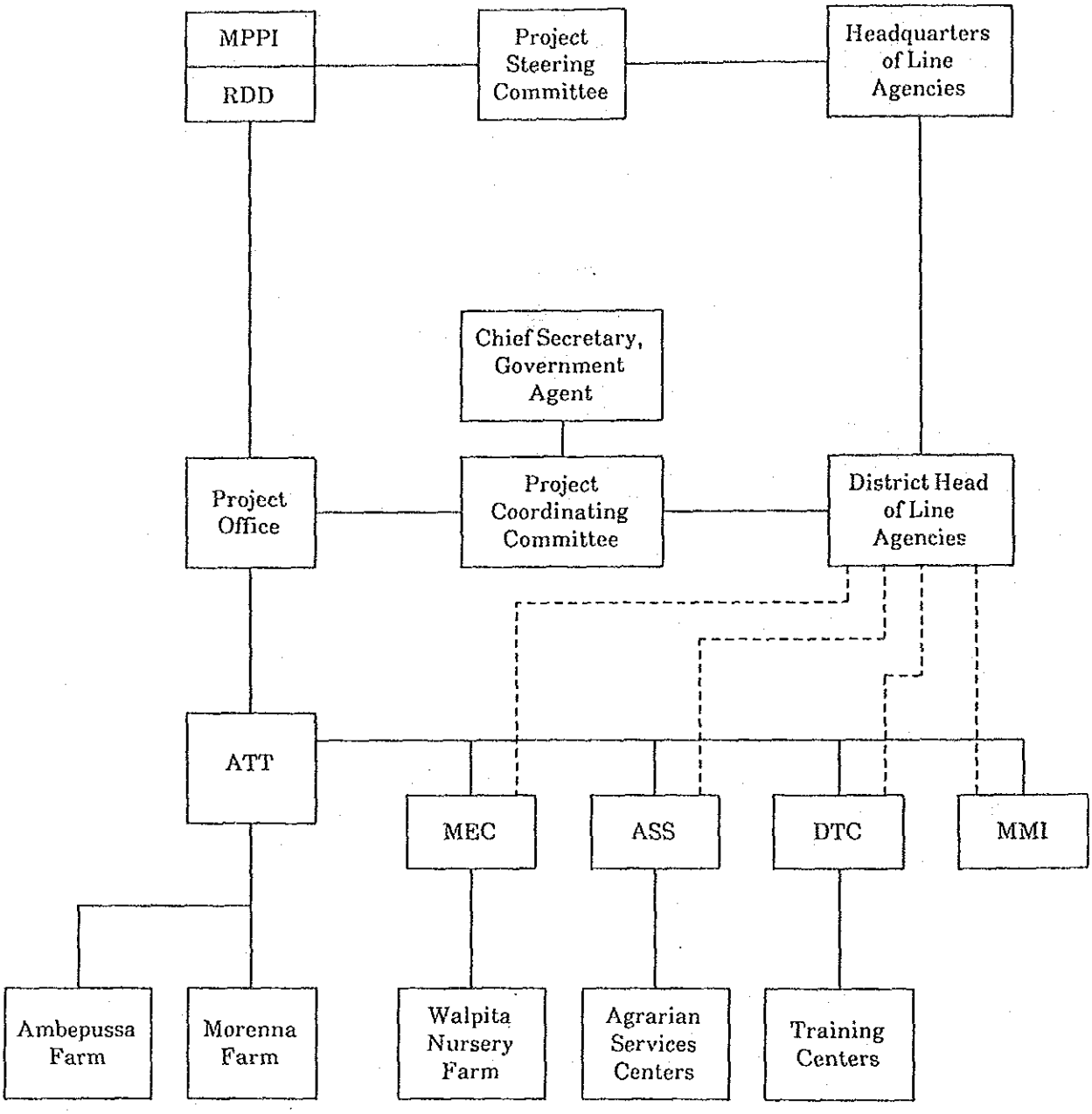
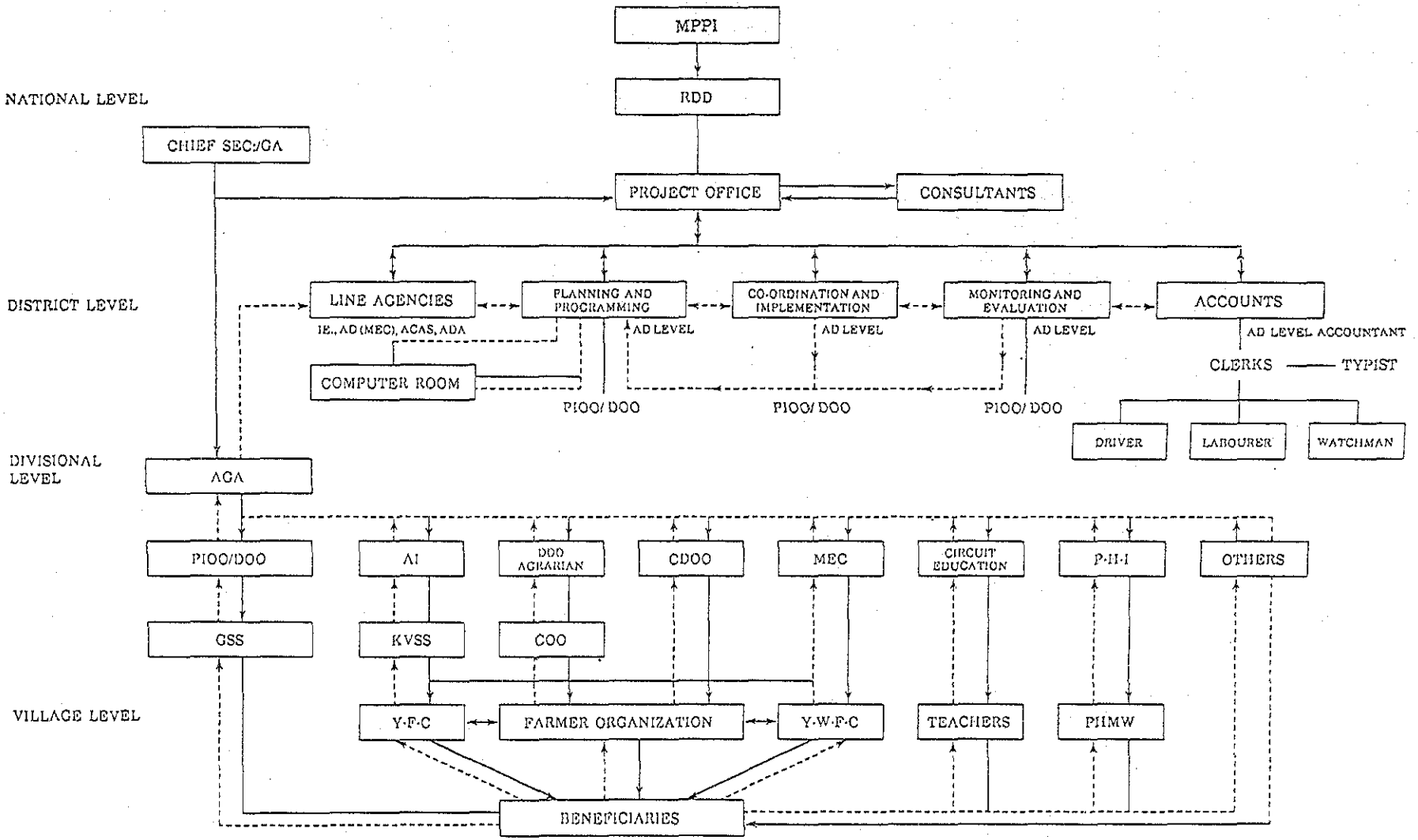


Fig. 4-4 ORGANIZATIONAL STRUCTURE – IRDP – GAMPAHA



4-4-2 Agricultural Technology Transfer Scheme

(1) ATT Operation Committee

The ATT Scheme is aimed at transfer of new cropping technology to district farmers. Appropriate cropping patterns will be demonstrated through model farms.

From a technical standpoint, the PO will integrate the activities of the ATT Scheme with those of the other 4 schemes to ensure compatibility among all aspects of the Project.

The ATT Operation Committee will determine the basic orientation and operating plan for the scheme. An ATT Office (director, technical staff, management staff) will be established to implement the policies of the committee.

The ATT Operation Committee will be a subcommittee of the IRDP Coordinating Committee, and it will be composed only of members of that committee whose activities are related to the agricultural sector.

Under the Project, assistant director class representatives of the Gampaha offices for the agencies related to the 5 schemes will all be members of the Operation Committee. These agencies include the Agriculture Department, Department of Agrarian Services, Minor Export Crops Department, Irrigation Department, Agricultural Development Authority, etc. The Project Director will chair the ATT Operation Committee, and the ATT Manager will serve as director. Other members are as follows:

1. Provincial Director of Agriculture

2. Deputy Directors (Research, Extension, Training and Education and Ag. Economics) - Western Province

3. Assistant Directors (Extension, Training and Education) - Gampaha District

4. Deputy Director, Minor Export Crops Department

5. Deputy Director, Coconut Development Board

6. Deputy Director, Agrarian Services Department

7. Deputy Provincial Director, Agricultural Development Authority

8. Deputy Director and Irrigation Engineer, Irrigation Department

9. Project Director, Gampaha IRDP

10. ATT Manager, Economics and Projects, Agriculture Department

(2) Organization

(i) Technical Staff

The ATT Manager should be a deputy director class official with both research and practical administration experience.

The following technical staff would be permanently assigned:

Agronomy (paddy):	Department of Agriculture, Ministry of Agricultural Development and Research
Agronomy (upland crops):	Department of Agriculture, Ministry of Agricultural Development and Research
Soil:	Department of Agriculture, Ministry of Agricultural Development and Research
Water management:	Irrigation Department, Ministry of Land and Land Development
Minor Export Crops:	Minor Export Crop Department, Ministry of Agricultural Development and Research
Farmers organization:	Agrarian Services Department, Ministry of Agricultural Development and Research
Marketing:	Economic Project Section of the Agriculture Department, Ministry of Agricultural Development and Research

(ii) General Staff

General staff to be employed at the ATT Center are as follows:

1. Publicity officer 1

2. Administrative office staff	5
3. Workshop mechanic	1
4. Farm machinery operator	2
5. Storekeeper	1
6. Technical support - audiovisual:	1
7. Farm and computer manager:	1
	12

(iii) Ambepussa Upland Crops Model Farm

The following staff will be necessary:

TABLE 4-4 PERSONNEL

Farm manager	Overall management, upland cropping and horticulture	1
Foreign expert	Vegetables: (1) Upland Crops, fruits, flowers: (1)	2
Local expert	Vegetables: (1) Upland Crops, fruits, flowers: (2)	3
Farm machinery operator	Tractor, etc.	1
Mechanic	(also to function as farm machinery operator and pump mechanic)	1
Driver		2
Clerical	Accounting, general office work	1
General workers	Vegetables: (5) Upland Crops, fruits, flowers: (10)	15
Watchman		1
Temporary workers		as needed
		27

(3) Support Organization for Research Development

In addition to practical cropping models under the scheme, long-term research and development on more revolutionary cropping potentials should also be undertaken. Such research and development would be performed at the following centers:

Makandura Regional Research Station, Gampaha

Bombuwela Regional Research Station, Kalutara

Coconut Research Institute

MEC Research Institute

(4) Cultivation Plan for Model Farm

(i) Intensive Cropping Model Farm (2.1ha)

(a) Scheme Area

The scheme area is government owned. At present, 16 households in the area are engaged in paddy cultivation. Of these, however, 13 households (81%) are part-time farmers. A total of 68 persons reside in the area.

Almost all farmers are engaged in double cropped rice cultivation. Food self-sufficiency is 163% assuming annual per capita rice consumption of 105kg.

Rice cultivation performance over the past 5 years is shown in the following table.

TABLE 4-5 RICE CULTIVATION PERFORMANCE OVER THE PAST 5 YEARS

	1984		1985		1986		1987		1988		Average	
Season	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala
Cropped area (ha)	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92
Harvested area (ha)	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92
Gross yield (t/ha)	5.0	7.1	4.7	6.5	5.2	7.0	4.7	6.5	5.1	6.7	4.9	6.8
Unit yield (t/ha)	2.6	3.7	2.4	3.4	2.7	3.6	2.4	3.4	2.7	3.5	2.6	3.5
Land use rate (%)	91	91	91	91	91	91	91	91	91	91	91	91
	182		182		182		182		182		182	

Source: Agricultural Development Authority, Gampaha

Diversion is relatively easy due to the proximity of the area to anicut works. The same area is cropped during the rainy seasons in both the Mala and Yala. A portion of area at higher elevations than the irrigation canal accounts for the land use rate of 182%.

Unit yield for the past 5 years in the Yala season averages 2.6t/ha which is considerably lower than the national average of 3.3t/ha. Yields during the Maha season are at levels equal to the national average. Plowing is mostly performed by hired 2W tractor, although in some cases water buffalo are used.

About 90% of planting is by direct seeding, with the remaining 10% by transplanting. Transplanting is by the random method.

(b) Implementation

Management of the model farm is to be carried out jointly by the experts in the various sectors assigned under the ATT Scheme and the farmers, utilizing the various facilities established under the Project. This joint effort will promote transfer of cropping technology to farmers, and stimulate an increase in farm income.

Farmer participation is anticipated to develop a practical model cropping system, and this is important given the role of the farm as a model for paddy farmers throughout the District.

In view of the need for establishment of an appropriate cropping and farm management technology base to facilitate extension work, various experimental studies must be carried out in addition to practical cultivation. Accordingly, the study indicated in the following table will be carried out jointly with farmers in addition to practical cropping. Specifics with regards to study components and cropped area should be determined through discussions between experts under the ATT Scheme and the farmers.

TABLE 4-6 STUDY COMPONENTS AT INTENSIVE CROPPING MODEL FARM

Study Item	Area (2.1Ha)	Study Components
Planting	0.6	Yields, quality, labor, etc. by planting method are compared and productivity identified. Post harvest survey is also carried out.
Broadcast sowing	(0.2)	
Transplanting		
Manual	(0.2)	
Machine	(0.2)	
Fertilizing	0.4	Appropriate fertilizer amounts and application periods are determined, and an economical fertilizing method established.
Variety comparison	0.4	Currently cultivated varieties and HYV recommended by the experimental farm are cultivated and compared.
Cropping pattern	0.3	An appropriate cropping pattern for the area is established with consideration to labor and profitability, and extension work performed. For example: a) Rice + rice b) Rice + vegetables + rice c) Rice + vegetables Introduction of upland crops and vegetables is done in coordination with activities at upland model farm at Ambepussa.
Water management	0.3	Irrigation requirement, timing for irrigation and drainage, etc. is determined, and extension work performed.
Pest control	--	Timing of appearance of pests and degree of damage to crops is studied, and a pest control program established.
Weed control	0.1	Weeding by hand and by herbicides are compared (weeding of entire field will be performed as it is to be a practical model)

(ii) Upland Crops Model Farm

(a) Upland Crops

Consumption of upland crops such as vegetables, etc. is on the increase with changes in eating habits and population increase. Cultivation of such crops in Gampaha district is limited to vegetables, fruits and other typical upland crops raised in home gardens.

The table below shows rates of self sufficiency for major upland products. With the exception of coconut, self-sufficiency has not been achieved for any of the items. Products are brought into Gampaha either from other districts or from abroad to meet this demand.

TABLE 4-7 SUPPLY OF FOOD CROPS IN GAMPAHA

(1985)

Crop	Production (tons)	Per Capita Consumption (kg)	Total Consumption (tons)	Supplied (%)
Coconut	384 Million Nuts	97.2 Nuts	136 Million Nuts	282.3
Paddy	81,296	105.0	146,790	55.4
Chillies	160	3.88	5,424	2.9
Cassava	1,009	9.91	13,854	7.3
Sweet Potato	385	1.25	1,747	22.0
Potato	n/a	2.93	4,096	n/a
Yams	723	0.65	908	79.6
Egg Plant	451	3.68	5,145	8.8
Ladies Fingers	265	1.37	1,915	13.8
Bitter Gourd	126	0.69	965	13.1
Cabbage	14	1.94	2,712	0.5
Cucumber	33	0.38	531	6.2
Raddish	53	0.89	1,244	4.2
Tomato	n/a	0.82	1,146	n/a

Source: District agriculture Office, 1985; Report of Consumer Finance and Socio-Economic Survey, 1981; Statistic Dept., 1985

At present there is much coconut field area which could be effectively used for inter-cropping of upland crops in order to increase self-sufficiency rates. This would also increase farm income.

Principal vegetables cultivated in the District include okra, beans, luffa, bitter gourd, chillis, etc. Their cultivation is generally concentrated in the Yala and Maha seasons. Although it is considered that these crops could be cultivated throughout the year, water is lacking during the dry season. Particularly during the off-seasons in February-March and August-September, vegetables are in short supply, and their cost rises accordingly.

It is judged that cultivation of vegetables in the dry season would be possible in coconut fields, availing of the ample groundwater (shallow wells) and cooler weather conducive to cultivation of these crops without fear of damage from rain.

The major production area for vegetable in Sri Lanka is currently Nuwara Eliya, 150km east of Colombo and at an elevation 1,800m. Nevertheless, tea plantations are predominant, and cultivated areas for vegetables are limited. Principal crops are potato, onion, cabbage, leek, and turnip, taking advantage of the cool climate.

Although this area competes with Gampaha District for the major market in Colombo, Gampaha has the advantage of closer proximity to the capital and is considered to have particularly good potential for supply of lowland vegetables which cannot be cultivated in Nuwara Eliya.

(b) Implementation Plan

① Method

The objective of the upland crops model farm is to increase land utilization and income through promotion of intercropping of vegetables and other typical upland crops in coconut fields. At the same time it is anticipated that the scheme will promote increased employment opportunities in the District.

The model farm will therefore have to be as practical as possible. However, in addition to practical cultivation methods, it will also be necessary to conduct various experimental studies at the farm to develop the optimum cultivating techniques and farm management system for the area. This is particularly important due to the relative unfamiliarity of farmers in the District with the cultivation of various upland crops.

An outline of the implementation plan for the model farm is set out below. Details should be worked out at the implementation stage of the Project between the foreign experts and officials of the concerned agencies and experts under the ATT Scheme.

② Crops

Envisioned crops and a breakdown of cultivated areas at the model farm are as follows:

TABLE 4-8 CROPS AND CULTIVATED AREA

Crops				Area
Vegetables	Outside	Tomato Melon Cucumber Egg plant	Okra Leaf vegetables Root vegetables Others	1.0
	Green house	Tomato Melon Cucumber	Leaf vegetables	0.2 (6m x 30m x 5 units) One unit for seedlings
Typical upland crops	Outside	Beans Chillis Ginger	Cassava Others	1.2
Fruits	Outside	Papaya Banana Passion fruit	Pineapple Lemon Others	2.5
Flowers	Outside	Antherium Orchid Rose	Others	0.2
Nursery		Vegetables, fruits		0.1
Total				5.2

Vegetable cultivation both outside and in greenhouse is planned. The greenhouses are to consist of a polyvinyl roof to prevent rain damage and control pests. High-yield, high quality vegetables will be raised in the greenhouses.

Cultivation in the greenhouse will be compared with that outside for possible extension to farmers.

③ Activities

The activities to be performed at the model farm will span both practical cultivation and experimental studies.

Farming techniques and crops at the farm will be based on practical cropping technologies developed at other research centers in the same wet zone area of Sri Lanka, or country(s) with a similar climate to that of the Project area.

A detailed crop study will be necessary (especially on vegetable cultivation), as the crops to be developed at the farm are characterized by the fact that they are primarily destined for intercropping in coconut fields and cultivation in paddy fields.

In the future, it will also be necessary to establish a model farm in actual coconut fields for intercropping based on the results at the model farm.

An outline of activities is as follows:

-- Variety comparison

Improved varieties suitable to the Project area will be selected for the principal crops, and yields and productivity studied and compared.

-- Cropping season and methods

Optimum cropping season and methods will be studied for each crop.

-- Fertilizing

Optimum amounts and timing for fertilizer application will be studied, and the most cost-effective fertilizing method will be determined. Particular attention will be given the use of organic substances.

-- Cropping pattern

The optimum cropping pattern will be formulated with attention to factors such as labor, profitability, etc.

-- Pest control

Timing of pest appearance and degree of damage will be studied, and effective control measures devised.

-- Irrigation

The most appropriate application method from among hose irrigation, furrow irrigation and sprinkler irrigation will be studied. A study will also be made of the

effectiveness of mulching with palm leaves, rice straw, etc., and the possibility for extension to farmers.

-- Harvest, post harvest and marketing

Optimum harvest season and required silo capacity will be identified and suitable shipping methods studied.

-- Other general crop management

(iii) Improved Drainage Model Farm

There are 22 households on the 3.5ha of the scheme area. They farm an average of 0.16ha. Full time farmers number 14 (64%) households, and part-time farmers are 8 (36%) households. Of these, independent farmers number 12 (55%) households and tenant farmers are 10 households (45%)

Population of the area is 54 persons. Rice self-sufficiency rate is 319%.

Farmers double crop rice, and average annual yield is 18.2 tons. Rice cultivation performance for the past 5 years is as shown below.

TABLE 4-9 RICE CULTIVATION PERFORMANCE FOR THE PAST 5 YEARS

	1984		1985		1986		1987		1988		Average	
Season	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala
Cropped area (ha)	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Harvested area (ha)	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Gross yield (t/ha)	8.3	9.6	7.8	10.4	7.5	10.4	7.9	10.6	7.5	11.3	7.8	10.4
Unit yield (t/ha)	2.7	3.1	2.5	3.4	2.5	3.4	2.5	3.4	2.4	3.6	2.5	3.5
Land use rate (%)	88.6	88.6	88.6	88.6	88.6	88.6	88.6	88.6	88.6	88.6	88.6	88.6
	177		177		177		177		177		177	

Source: Agricultural Development Authority, Gampaha

Land use rate in the area is 177%. Unit yield is a low 2.5t/ha in the Yala season. However, yield in the Maha season equals the national average. Low yield in the Yala season is attributed to inundation and flood damage.

Where irrigation and drainage can be easily performed, unit yields are 3.1t/ha in the Yala season and 3.7t/ha in the Maha season. Accordingly, the

effect of improved drainage can be expected to be great. Plowing is 100% by 4 wheel tractor. Seeding is 65% by the broadcast method, and 35% by transplanting. Transplanting is more extensively applied than in other areas.

3-3.5 month seed varieties are used in the Yala season and 4 month varieties in the Maha season.

With the improvement of drainage facilities, and guidance of experts under the ATT Scheme, it is anticipated that good fertilized farming management will be possible, enabling unit yields of 4t/ha in the Yala season and 5t/ha in the Maha season.

4-4-3 Minor Export Crop Promotion Scheme

(1) Minor Export Crops

The Minor Export Crop Department has been established to promote the cultivation of these crops with a view to increasing foreign currency earnings. Principal minor export crops in Sri Lanka are tea, rubber, and coconut. Other MEC's are pepper, coffee, cocoa, cinnamon and clove.

The table below shows production and export amounts of MEC's.

TABLE 4-10 CROPPING AND EXPORT OF MEC'S

Crop	Cropped Area (ha)	Production (MT)	Export (MT)	Earnings (million Rs)
Pepper	7,037	2,514	2,015.72	286.35
Coffee	9,801	1,851	881.67	45.82
Cocoa	13,227	1,350	817.20	37.44
Cinnamon	16,014	7,500	7,413.76	447.83
Clove	7,706	565	491.72	40.61
	5,240	284	191.62	35.15
Citronella	6,193	122	96.19	16.54
	2,463	280	250.53	28.33

Source: MECD (1987)

MEC's cropped in Gampaha are mainly pepper, coffee, cinnamon and clove. The Minor Export Crop Department has moved actively to promote cultivation of MEC's in the District since 1983. As of 1988, 32,000ha have been cultivated. Performance is as shown in the table below.

TABLE 4-11 MEC PRODUCTION

Crop	Harvested Area (ha)	Unit Yield (kg/ha)	Production (MT)
Pepper	507.30	450	228.28
Coffee	740.22	336	248.71
Cocoa	4.00	225	0.90
Cinnamon	531.20	336	178.48
Clove	419.00	56	23.48

Source: MECD Gampaha

At present, it is estimated that 16,000ha of coconut fields (trees 15-45 years old) are available for intercropping of MEC's in Gampaha District. The MEC Department is actively promoting the cultivation of pepper and coffee as intercrops due to their suitability given climatic, soil and socioeconomic conditions in Gampaha.

However, the following problems have constrained efforts by the MEC Department: i) seedlings produced by contract farmers are in short supply, and good varieties are not available, ii) farmers are not familiar with necessary cropping technology, iii) extension facilities are insufficient and iv) post-harvest quality control is lacking. The role of the seedling production center under the scheme will play an important role in rectifying these problems.

(2) Cropping Plan and Seedling Production Plan

(i) Cropping Plan

Pepper and coffee are selected for promotion as MECs on the basis of climatic, soil, socioeconomic and farming conditions in Gampaha as well as the results of experimental cropping studies in other districts.

① Planting Method

-- Pepper based: pepper (850 plants) + coffee (750 plants) = 1,600 plants/ha

-- Coffee based: coffee (1,125 plants) + pepper (375 plants) = 1,500 plants/ha

② Target Cropped Area

The target for annual cropping area is as shown below. Double cropping during the Yala (April-June) and Maha (October to December) seasons is planned.

TABLE 4-12 TARGET FOR ANNUAL CROPPING

	Planting Method	Annual Planted Area (ha)	5 Year Total (ha)
1st Stage (1-5 years)	Pepper based Coffee based	400 200	2,000 1,000
2nd Stage (6-10 years)	Pepper based Coffee based	600 400	3,000 2,000
3rd Stage (11-15 years)	Pepper based Coffee based	1000 500	5,000 2,500
Total (1-15 years			15,500

(ii) Seedling Production Plan

① Seedling Production

The following seedling production will be necessary to plant the targeted cropping area.

TABLE 4-13 PLAN FOR SEEDLING PRODUCTION

	Crop	Required Seedlings Per year*	Seedling Procurement	
			Seedling Center	Contract Farmers
1st Stage	Pepper	415,000	300,000	115,000
	Coffee	525,000	400,000	125,000
2nd Stage	Pepper	660,000	400,000	260,000
	Coffee	900,000	600,000	300,000
3rd Stage	Pepper	1,037,500	600,000	437,500
	Coffee	1,312,500	900,000	412,500

*Seedlings necessary for 1st stage:

Pepper

850 plants/ha × 400ha = 340,000
375 plants/ha × 200ha = 75,000
415,000 plants

Coffee

750 plants/ha × 400ha = 300,000
1,125 plants/ha × 200ha = 225,000
525,000 plants

Limitations on nursery bed space and labor will make it difficult to obtain all the necessary seedlings from the seedling production center. A portion of the seedlings will thus be obtained from contract farmers. Priority will be given to small farmers for contract production of seedlings, with technical guidance in cropping to be provided.

② Seed Farm

Pepper

A seed farm (mother plants) is necessary to provide good varieties of pepper seedlings. The poly-pack system proposed at the research center of the Minor Export Crop Department is to be adopted. Under this system, 25 good seedlings are obtained from 1 mother plant, for a total

output of 750,000 seedlings per ha. Therefore, 1ha of mother plants can cover the seedling requirement up through the 2nd stage of the scheme. However, 1.4ha of seed farm are becomes necessary in the 3rd stage.

Mother plants for the seed farm will be initially obtained from the research center of the Minor Export Crop Department. It will be necessary to plant shade and support plants prior to planting the mother pepper plants. Glenicida is good as a shade plant due to its rapid growth, although fruit trees such as banana and papaya could also be considered. Also, it would be possible to use coya-net manufactured from coconut.

Coffee

Coffee seeds will initially be obtained from the research center of the Minor Export Crop Department. After 3-4 years, seeds would be obtained from the mixed cropping model farm to be established under the scheme.

(iii) Nursery Beds

Necessary nursery beds at the seed production center are as follows.

TABLE 4-14 SEEDLING BEDS

	Pepper	Coffee
1st Stage (1-5 years)	20m² × 84beds (14 houses) = 1,680m² 330,000 plants: 165,000 (Yala) 165,000 (Maha) (including allowance for 10% dead or low quality plants) 20m² = 2,000 seedlings 165,000 ÷ 2,000 = 83 beds	① 20m² × 110 beds (18 houses) = 2,200m2 ② 20m² × 12 beds (2 houses) = 240m2 (broadcast bed) 440,000 plants: 220,000 (Yala) 220,000 (Maha) (including allowance for 10% dead or low quality plants) ① 220,000 ÷ 2,000 = 110 beds (18 houses) ②Broadcast bed = 1m2 × 1,000 seeds (220,000 ÷ 1,000 = 220m²) 220m² ÷ 20m² = 11 beds Total: 12 beds including 1 reserve
2nd Stage (6-10 years)	20m² × 108beds (18 houses) = 2,160m²	① 20m² × 162 beds (27 houses) = 3,240m2 ② 20m² × 18 beds (3 houses) = 360m2
3rd Stage (11-15 years)	20m² × 162 beds (27 houses) = 3,240m2	① 20m² × 246 beds (41 houses) = 4,920m2 ② 20m² × 24 beds (4 houses) = 480m2

(3) Mixed Cropping Model Farm

As coconuts are not cultivated at the site, the farm will not serve as an inter-cropping model. A suitable coconut field will have to be selected for this purpose. Nevertheless, the mixed cropping model farm will play an important role in cropping technology development, demonstration and seed production.

Shade and support plants will have to be planted at least 1 year prior to cultivation of the main crops of pepper and coffee.

(4) Operation

(i) Seedling Distribution

Good seedlings produced by contract farmers and at the seedling center will be selected by experts from the Minor Export Crop Department and distributed to farmers through Agrarian Service Centers under the ATT Scheme.

(ii) Activities

The seedling production center will produce good quality seedlings, offer guidance in cultivation, perform experimental studies on various varieties, and disseminate information about minor export crops.

(iii) Personnel

The following personnel will be necessary.

TABLE 4-15 PERSONNEL

Designation	No.	Remarks
Farm manager	1	Overall management
Expert	2	Seedling production: (1) Research and guidance in cropping technology: (1)
Farm machinery operator	1	Tractor, etc.
Mechanic	1	Farm machinery repair
Driver	2	
Clerical	1	Accounting, general office work
General workers	10	
Watchman	1	
Temporary workers	as needed	
Total	19	

Employees will be selected to the degree possible from among small farmers with the purpose of both providing a livelihood and transfer of technology. Contracts, however, would be limited to 1-2 years to give opportunity for working on the farm to as many small farmers as possible.

(5) Profitability of MEC

Profitability of cultivation under the scheme has been calculated for both pepper based and coffee based planting. Results are shown in Tables 16 and 17.

Under pepper based cultivation (10,000ha), a profit is turned after 4 years for pepper and 6 years for coffee. Profit in the 6th year for pepper and coffee is Rs 15 million (Rs 25,000 /ha). In the 18th year when the total 15,500ha can be harvested, earnings for pepper based cultivation are Rs 662 million and Rs 227 million for coffee based.

This total of Rs 889 million would be of major benefit to the farmers of Gampaha District. Export of the crops would contribute significantly to foreign exchange earnings of the country.

In order to achieve the goals of the Project, it is important that the subsidy program of the MEC Department be continued (Rs 6,250 for pepper growers and Rs 7,500 for coffee growers).

It is also recommended that highly cash convertible, short growing period crops be introduced until profitability is achieved for pepper and coffee.

TABLE 4-16 Profitability under Pepper Based Cultivation

Item \ Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Cropping area (ha)		400	400	400	400	400	600	600	600	600	600	1000	1000	1000	1000	1000	-	-	-	-	-	10,000
Total cropping area (ha)		400	800	1200	1600	2000	2600	3200	3800	4400	5000	6000	7000	8000	9000	10000	-	-	-	-	-	
Number of plants (1000 pcs)	Pepper	340	340	340	340	340	510	510	510	510	510	850	850	850	850	850	-	-	-	-	-	8,500,000
	Coffee	300	300	300	300	300	450	450	450	450	450	750	750	750	750	750	-	-	-	-	-	7,500,000
Total number of plants (1000 pcs)	Pepper	340	680	1020	1360	1700	2210	2720	3230	3740	4250	5100	5950	6800	7650	8500	-	-	-	-	-	
	Coffee	300	600	900	1200	1500	1950	2400	2850	3300	3750	4500	5250	6000	6750	7500	-	-	-	-	-	
Production (M.T/Dry)	Pepper	-	-	-	425	850	1276	1700	2126	2764	3402	4039	4677	5315	6378	7441	8504	9567	10630	10630	10630	
	Coffee	-	-	-	126	252	378	504	630	819	1008	1197	1386	1575	1890	2205	2520	2835	3150	3150	3150	
Gross income (Rs/M)	Pepper	-	-	-	25.2	51.0	76.6	102	127.6	165.8	204.1	242.3	280.6	318.9	382.7	446.5	510.2	574	637.8	637.8	637.8	
	Coffee	-	-	-	5.4	10.8	16.3	21.7	27.1	35.2	43.4	51.5	59.6	67.7	81.3	94.8	108.4	122	135.5	135.5	135.5	
Production Cost (Rs/M)	Pepper	3.9	6.3	9.0	12.3	15.2	20.0	24.1	28.4	33	37.4	45.7	52.6	59.7	67.4	74.8	72.5	73.8	74.4	73.5	16.2	
	Coffee	1.9	2.7	3.7	4.8	6.3	8.8	10.7	12.6	14.7	17.0	21.2	24.3	27.6	31	34.8	33.8	35.6	37	38	38	
Net Profit (Rs/M)	Pepper	△3.9	△10.2	△19.2	6.3	35.8	56.6	77.9	99.2	132.8	166.7	196.6	228	259	315.3	371.7	437.7	500.2	563.4	564.3	621.6	
	Coffee	△1.9	△4.6	△8.3	△7.7	△3.2	4.3	11.0	14.5	20.5	26.3	30.3	35.3	40.1	50.1	60	74.6	86.4	98.5	97.5	97.5	
Pepper + Coffee (Rs/M)		△5.8	△14.8	△27.5	△1.4	32.6	60.9	88.9	113.7	153.3	193	226.9	263.3	299.1	365.4	431.7	512.3	586.6	661.9	661.8	719.1	

Notes; 1) Number of plants per ha.: pepper 850 pcs., coffee 750 pcs.
2) Yield/ha.: pepper 1,063 kg, coffee 315 kg (MECD)
3) Farm gate price per kg (Dry): pepper Rs. 60, coffee Rs. 43 (present price by interview survey)
4) Production cost: calculated based on the production cost of pepper (1700 pcs/ha), coffee (3025 pcs./ha)

TABLE 4-17 Profitability under the Coffee Based Cultivation

Item \ Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Cropping area (ha)		200	200	200	200	200	400	400	400	400	400	500	500	500	500	500						5,500
Total cropping area (ha)		*200*	*400*	*600*	*800*	*1000*	*1400*	*1800*	*2200*	*2600*	*3000*	*3500*	*4000*	*4500*	*5000*	*5500*						
Number of plants (1000 pcs)	Pepper	75	75	75	75	75	150	150	150	150	150	187.5	187.5	187.5	187.5	187.5						
	Coffee	225	225	225	225	225	450	450	450	450	450	562.5	562.5	562.5	562.5	562.5						
Total number of plants (1000 pcs)	Pepper	75	150	225	300	375	525	675	825	975	1125	1312.5	1500	1687.5	1875	2062.5	2062.5	2062.5	2062.5	2062.5	2062.5	
	Coffee	225	450	675	900	1125	1575	2025	2475	2925	3375	3937.5	4500	5062.5	5625	6187.5	6187.5	6187.5	6187.5	6187.5	6187.5	
Production (M.T/Dry)	Pepper	-	-	-	100	200	300	400	500	700	900	1100	1300	1500	1750	2000	2250	2500	2750	2750	2750	
	Coffee	-	-	-	93	185	278	370	463	648	833	1019	1204	1389	1621	1852	2084	2315	2547	2547	2547	
Gross income (Rs/M)	Pepper	-	-	-	6	12	18	24	30	42	54	66	78	90	105	120	135	150	165	165	165	
	Coffee	-	-	-	4	8	12	15.9	19.9	27.9	35.8	43.8	51.8	59.7	69.7	79.6	89.6	99.5	110	110	110	
Production Cost (Rs/M)	Pepper	0.86	1.39	1.99	2.72	3.37	4.86	6.08	7.33	8.75	10.05	11.85	13.35	14.75	16.55	18.15	17.55	17.85	17.95	17.75	7.1	
	Coffee	1.4	2.0	2.7	3.5	4.6	7.2	8.9	10.7	12.7	14.9	17.8	20.3	22.9	25.5	28.3	27.5	28.8	29.8	30.5	30.5	
Net Profit (Rs/M)	Pepper	Δ0.86	Δ2.25	Δ4.24	Δ0.96	7.67	13.14	17.92	22.67	33.25	43.95	54.15	64.15	75.25	88.45	101.85	117.45	132.15	147.25	147.25	157.9	
	Coffee	Δ1.4	Δ3.4	Δ6.1	Δ5.6	Δ2.2	2.6	7.0	9.2	12.7	20.9	26	31.5	36.8	44.2	51.3	62.1	70.7	80.2	79.5	79.5	
Pepper + Coffee (Rs/M)		Δ2.26	Δ5.65	Δ10.34	Δ6.56	Δ1.09	14.65	24.92	31.87	45.95	64.85	80.15	95.65	112.05	132.65	153.15	179.55	202.85	227.45	226.75	237.4	

Notes; 1) Number of plants per ha.: pepper 375 pcs., coffee 1,125 pcs.
2) Yield/ha.: pepper 500 kg, coffee 463 kg (calculated based on average yields/ha)
3) Farm gate price and production cost: same as pepper based

TABLE 4-18 Production Cost of Pepper per Hectare

	1st Year		2nd Year		3rd Year		4th Year		5th Year	
	Labor cost (M/D) (Rs)	Farm input (Rs)	Labor cost (M/D) (Rs)	Farm input (Rs)	Labor cost (M/D) (Rs)	Farm input (Rs)	Labor cost (M/D) (Rs)	Farm input (Rs)	Labor cost (M/D) (Rs)	Farm input (Rs)
Land Clearing	(15) 600									
Soil Conservation	(25) 1,000									
Holing	(88) 3,520									
Manure application	(25) 1,000									
Pill holes	(38) 1,520									
Gliricidea (shade tree)	(8) 320	1,700								
Plants (seedling)	-	3,400								
Planting	(38) 1,520									
Mulching	(25) 1,000		(25) 1,000		(25) 1,000		(25) 1,000			
Infilling	(13) 520		(13) 520		(8) 320					
Wedding			(55) 2,200		(65) 2,600		(65) 2,600			
Fertilizing	(38) 1,520	1,875	(100) 4,000	1,875	(100) 4,000	2,500	(100) 4,000	2,500	(100) 4,000	2,500
Weeding			(25) 1,000		(25) 1,000		(25) 1,000		(25) 1,000	
Pruning Vines			(8) 320		(13) 520		(38) 1,520		(38) 1,520	
Pest/disease Control			(5) 200	1,000	(5) 200	1,500	(5) 200	2,250	(5) 200	2,250
Harvesting							(30) 1,200		(63) 2,520	
Processing							(5) 200		(13) 520	
Clean grade							(3) 120		(5) 200	
Production Cost (1700 pcs/ha)	12,520	6,975	9,240	2,875	9,640	4,000	11,840	4,750	9,960	4,750
Total (Rs)	19,495		12,115		13,640		16,590		14,710	
Production cost for Pepper based (850 pcs.)	(50%) 9,748		6,057.5		6,820		8,295		7,355	
Production cost for Coffee based (375 pcs.)	(22%) 4,300		2,670		3,000		3,660		3,240	

TABLE 4-19 Production Cost of Coffee per Hectare

	1st Year		2nd Year		3rd Year		4th Year		5th Year	
	Labor cost (M/D) (Rs)	Farm input (Rs)	Labor cost (M/D) (Rs)	Farm input (Rs)	Labor cost (M/D) (Rs)	Farm input (Rs)	Labor cost (M/D) (Rs)	Farm input (Rs)	Labor cost (M/D) (Rs)	Farm input (Rs)
Land Clearing	(15) 600									
Soil Conservation	(25) 1,000									
Holing	(100) 4,000									
Manure application	(20) 800	1,000								
Fill holes	(25) 1,000									
Plants (seedling)		6,050								
Planting	(30) 1,200									
Mulching	(10) 400									
Infilling	(25) 1,000		(25) 1,000		(25) 1,000		(25) 1,000		(25) 1,000	
Weeding			(55) 2,200		(55) 2,200		(55) 2,200	2,500	(55) 2,200	
Fertilizing	(25) 1,000	1,250	(38) 1,520	1,875	(63) 2,520	2,500	(63) 2,520		(63) 2,520	3,750
Pruning			(5) 200		(5) 200		(13) 520		(40) 1,600	
Pest/disease Control			(5) 200	1,000	(5) 200	1,000	(5) 200	1,000	(5) 200	1,500
Harvesting							(25) 1,000		(40) 1,600	
Processing							(5) 200		(13) 520	
Clean grade							(3) 120		(5) 200	
Production Cost (3,025 pcs/ha)	11,000	8,300	5,120	2,875	6,120	3,500	7,760	3,500	9,840	5,250
Total (Rs)	19,300		7,995		9,620		11,260		15,090	
Production cost for Pepper based (750 pcs.)	(25%) 4,825		2,000		2,400		2,800		3,770	
Production cost for Coffee based (1,125 pcs.)	(37%) 7,140		2,960		3,600		4,200		5,580	

4-4-4 Morenna Model Irrigation Scheme

(1) Scheme Area

(i) Farming

There are 836 farm households in the scheme area. Of these, 730 (87%) are part time. Full time farmers number only 106 households (13%). Independent farmers make up 57%, while 43% are tenant farmers. The majority of land holdings are under 1ha, with average paddy holdings at 0.48ha. Only paddy is cropped in the area. It is double cropped, with cultivation during the Yala (April-June) and Maha (October-December) seasons.

(ii) Rice Production

Rice production in the area for the past 5 years is as shown below.

TABLE 4-20 RICE PRODUCTION IN MORENNA FOR THE PAST 5 YEARS

	1984		1985		1986		1987		1988		Average	
Season	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala
Cropped area (ha)	367	386	367	386	351	371	351	371	351	370	357	377
Harvested area (ha)	365	383	363	384	345	366	346	367	346	367	353	373
Gross yield (t/ha)	766	996	763	960	759	987	796	1028	727	1138	762	1022
Unit yield (t/ha)	2.1	2.6	2.1	2.5	2.2	2.7	2.3	2.8	2.1	3.1	2.1	2.7
Land use rate (%)	94	99	94	99	90	95	90	95	90	95	91	97
	193		193		185		185		185		188	

Source: Agricultural Development Authority, Gampaha

Land use rate averages 188%. However, average unit yields of 2.1t/ha in the Yala season and 2.7t/ha in the Maha season are considerably lower than the national averages of 3.3t/ha and 3.5t/ha, respectively. The principal reasons for this are i) part time farmers are numerous, ii) water shortage due to superannuated irrigation facilities and flood damage due to superannuated drainage facilities and iii) low levels of cropping technology.

(iii) Cropping Pattern

The cropping pattern in the area is shown in Fig.-A. The cropped area in the Yala season in 1988 is 351ha. 83% (291ha) of the land is in 3-3.5 month varieties. Field preparation and seeding (including transplanting) is commenced at the end of April and completed by mid-May. Harvesting, threshing and post harvest work begins at the end of July and is completed by mid-August.

In the Maha season, 370ha are cultivated. 93% (344ha) of the land is in 4 month varieties. The remaining 7% is in 3 month varieties. Field preparation and seeding (including transplanting) is completed from the beginning to mid-October (3 month varieties in mid-November), and harvesting, threshing and post harvest work is completed from beginning to mid-February.

(iv) Labor, Farm Machinery and Livestock

① Labor

Details on labor are not available due to lack of statistics on population, age, sex, etc., for the area. However, estimates of population by age and labor per farm household were made using data for other areas in Gampaha District.

TABLE 4-21 POPULATION BY AGE

Households	Population	Population by Age			
		0-9	10-14	15-64	over 65
836	5,521	1,393	865	3,148* (2,418)	115

*Figure in parenthesis is less part time farmers

FIG. 4-5 Present Cropping Patterns (1988)

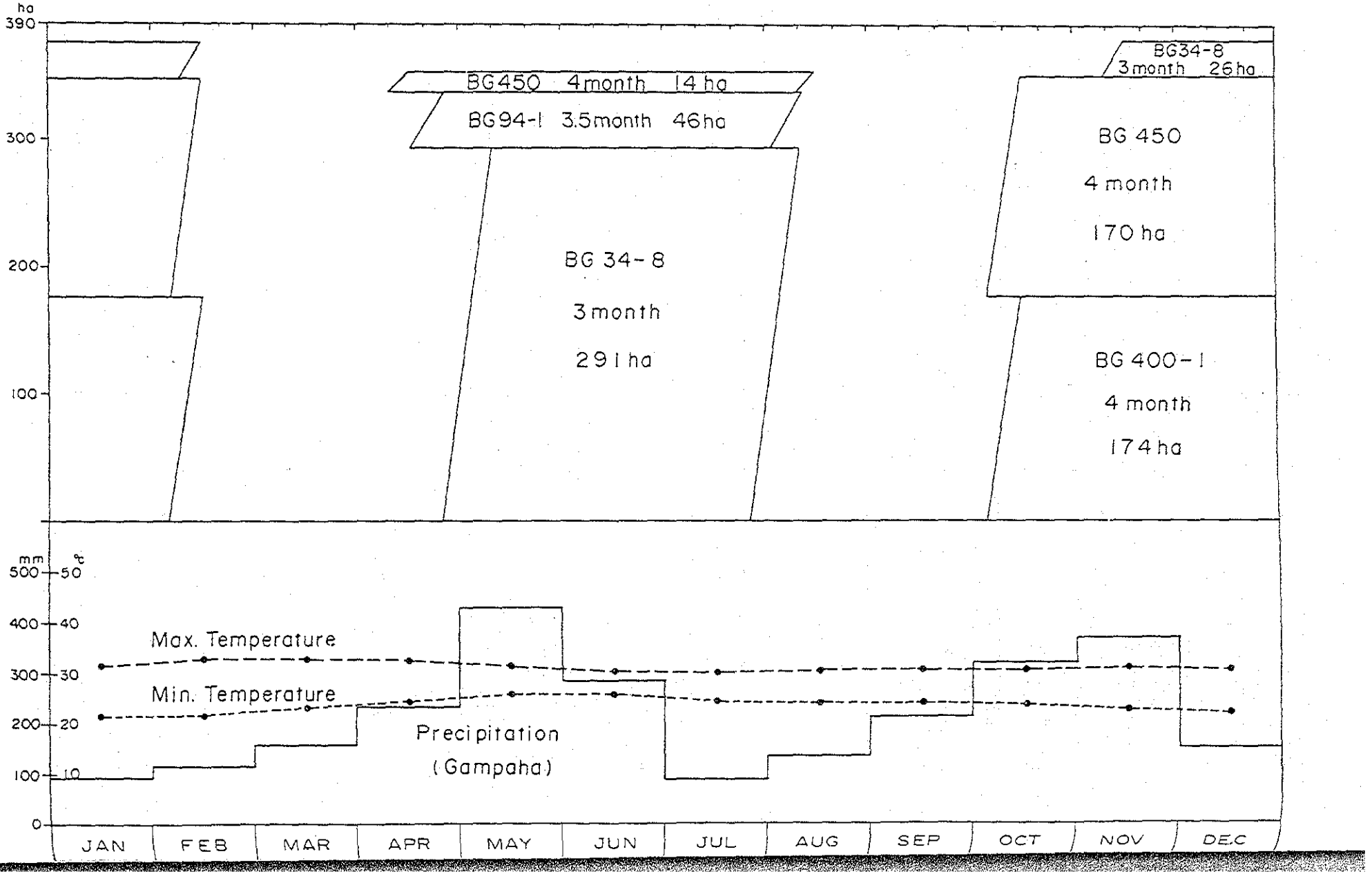


TABLE 22 LABOR PER HOUSEHOLD

Age Group	No. of family members	Labor Rate	Labor Population
0-9	1.7	0	0
10-14	1.0	50	0.5
15-64	3.8	100	3.8 (2.9)*
over 65	0.1	50	0.05
--	6.6	--	4.35 (3.45)*

*Figure in parenthesis is less part time farmers

According to the above table, available labor is estimated at:

836 households × 3.45 (labor population per household) × 25 days (working days per month) × 0.95 (5% absence due to illness, etc.) = 68,500 man-days /month

If labor is put at 50 persons per ha during the busiest seasons (field preparation, seeding and harvest), there is still an excess of labor of 50,000 man-days /month.

② Farm Machinery and Livestock

Farm machinery and livestock in the scheme area is as follows.

TABLE 23 FARM MACHINERY AND LIVESTOCK

Farm Machinery				Livestock		
4 wheel tractor	2 wheel tractor	Thresher	Sprayer	Cattle	Goat	Chickens
4	15	6	19	482	23	957

4 wheel and 2 wheel tractors effectively fulfill the requirements of plowing. However, the threshers are in short supply. A certain portion of threshing is consequently performed by treading by cattle or tractors.

4 wheel and 2 wheel tractor and cattle utilization is described in the following table.

TABLE 4-24 MACHINERY AND LIVESTOCK USE

	Use Rate (%)	Yala (ha)	Maha (ha)
4 W tractor	34	119	126
2 W tractor	47	165	174
Cattle	19	67	70
Total		351	370

(v) Cultivation Method

Field preparation and plowing are principally performed by hired 4 wheel and 2 wheel tractors. Broadcast seeding is done for 71% of the cropped area, and transplanting only for 29%. Transplanting is done randomly at intervals of roughly 15cm × 15cm. Regular planting is not practiced.

Weed control is performed manually or with herbicides. However, this is not done thoroughly, and weeds are numerous. Fertilizer amount and timing of application varies from farmer to farmer. Water management such as midseason drainage and surface drainage is generally not performed at the field level.

Harvesting is done manually. In almost all cases reaping is done such that 15-30cm of stalk remains. A portion of this is burned, plowed or grazed upon by livestock.

Threshing is mostly done by local threshing machines. A certain portion of threshing, however, is performed by treading by cattle or tractors.

(2) Scheme Description

(i) Design Cropping Pattern

The design cropping pattern is indicated in Fig. 4-6. It takes into consideration conditions in the area such as labor, degree of farm

mechanization, etc. Three month varieties are to be cultivated in the Maha season. Planting is to be moved up so that the dry period between the Maha and Yala seasons may be used for cultivation of short growth period upland crops (60-90 days).

Although effective farming practices would permit triple cropping of rice, more highly cash-convertible upland crops are appropriate given water shortages and rice self sufficiency in the area of 300%. Initially, cultivation of okra and beans is planned, as these are already well established in the Sri Lankan diet. It is recommended that introduction of upland crops be performed under the guidance of ATT Scheme experts, and be based on results at the Morenna intensive model farm and the upland crop model farm at Ambepussa.

(ii) Target Yields

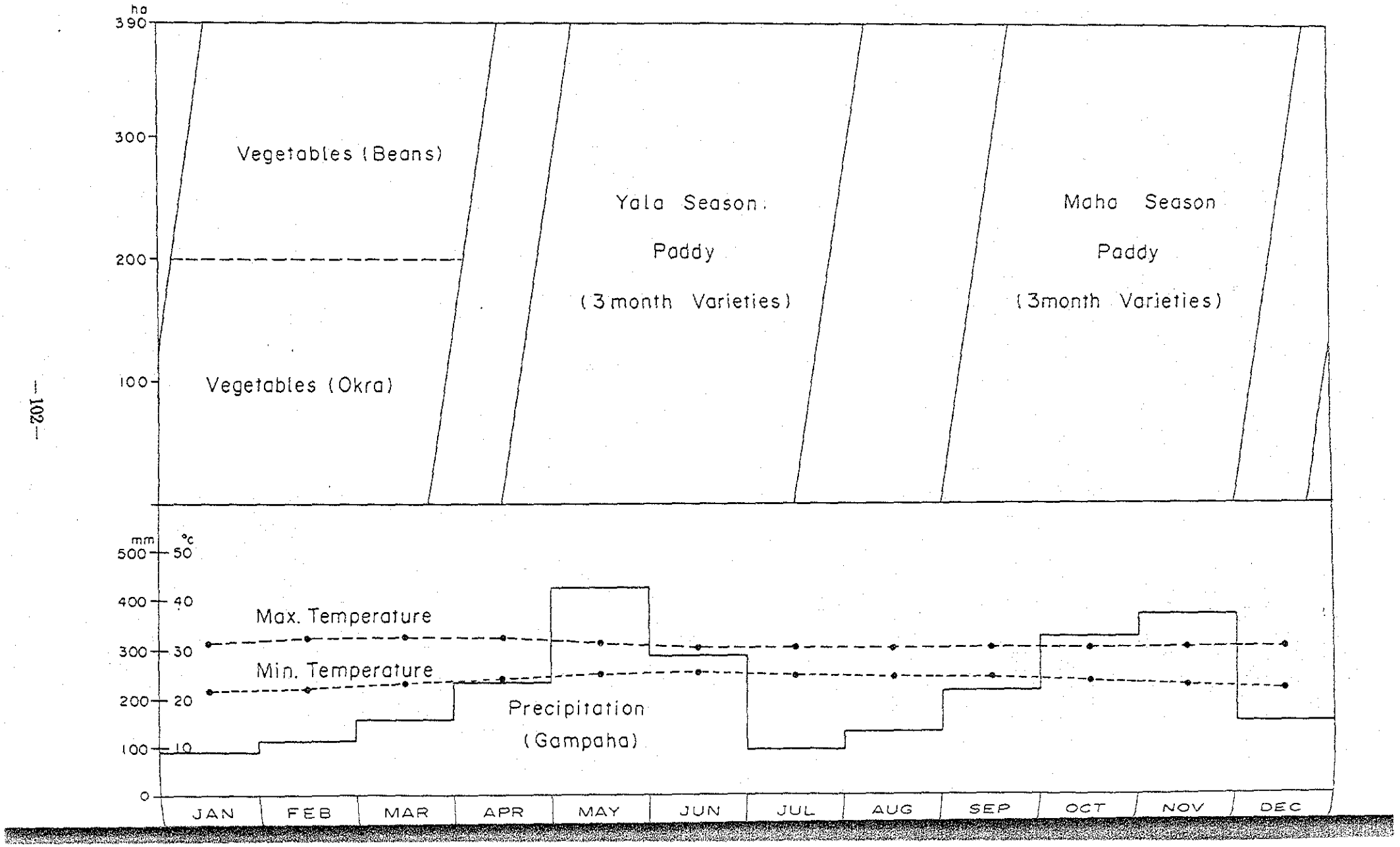
Fertilized cultivation well managed under the ATT Scheme experts and taking advantage of irrigation facilities to be established under the scheme would produce the following yields.

TABLE 4-25 YIELDS WITH AND WITHOUT SCHEME

		Current			With the Scheme		
		Area (ha)	Unit Yield (t/ha)	Total Production (t)	Area (ha)	Unit Yield (t/ha)	Total Production (t)
Rice (rainy season)	Yala	351	2.1	727	390	4.0	1,560
	Maha	370	3.1	1,138	390	4.5	1,755
Upland Crops (dry season	Okra	--	--	--	195	11.0	2,145
	Beans	--	--	--	195	7.0	1,365

The target yields for paddy have been estimated based on current farm yields in the area and results at experimental farms. Upland crop estimates are approximated from the findings of an interview survey of concerned officials in the Sri Lankan Government.

FIG. 4-6 Proposed Cropping Patterns



(iii) Profitability

Income under the scheme is estimated as follows:

TABLE 4-26 SCHEME PROFITABILITY

	Cropping Season	Current (Rs)	With Scheme (Rs)
Gross income	Yala (rice)	3,581,400 (762t × Rs 4.7)	7,332,000 (1560t × Rs 4.7)
	Maha (rice)	4,803,400 (1,022t × Rs 4.7)	8,248,500 (1,755t × Rs 4.7)
	Dry season okra	--	19,305,000 (2,145t × Rs 9)
	beans	--	8,872,500 (1,365t × Rs 6.5)
Production cost	Yala (rice)	2,510,350 (351ha × 7,135)	3,354,000 (390ha × 8,600)
	Maha (rice)	3,529,800 (370ha × 9,530)	3,354,000 (390ha × 8,600)
	Dry season okra	--	6,708,000 (195ha × 34,400)
	beans	--	838,500 (195ha × 4,300)
Net Profit	Yala (rice)	1,071,050	3,978,000
	Maha (rice)	1,273,600	4,894,500
	Dry season okra		12,597,000
	beans		8,034,000
Total		2,344,650	29,503,500

Note: Farm gate price: Rice: Rs 4.7/kg
Okra: Rs 9/kg
Beans: Rs 6.5/kg

Upland crop production cost: As data was not available, the cost of okra was estimated at 4 times that for rice, and beans at 0.5 times that for rice. For the rice production cost, figures adopted have been adjusted 20% more than the figures for 1986.

Effect of the scheme on the area would be major. As can be seen from the above, net profit in the area under the scheme would be markedly higher at Rs 29,503,650 (an average of Rs 35,300/year per household) as opposed to the current Rs 2,344,650 (an average of Rs 2,800/year per household).

(3) Operation and Maintenance Plan

A District Agricultural Committee has been established primarily for the Attanagalu irrigation area. The Committee holds cultivation meetings at the start of the Maha and Yala seasons, as well as monthly meetings. In addition, special meetings are held when required. The Committee draws up annual and seasonal farming guidance plans for water management, fertilizer and agro-chemical application, and operates and maintains water use facilities.

The District Agriculture Committee is composed of representatives from the Irrigation Department, Agricultural Department, ADA, Gampaha Kacheri and farmer representatives.

The Agriculture Department is responsible for O/M of headworks and main canals, while diversion from the main canal, on-farm water management and minor irrigation schemes are the jurisdiction of the Agrarian Services Department.

The Agrarian Services Department and the Extension Division of the Agriculture Department provide guidance through block demonstration schemes at the farm level in water management, and fertilizer and agro-chemical application.

Following completion of the Morenna main canal rehabilitation, guidance in water management and farm management will continue under the District Agricultural Committee.

Cropping practices developed under the intensive cropping model farm will be introduced to farmers through the above existing O/M structure.

4-4-5 Farm Management

(1) Crops

Principal crops in the District are coconut and rice. However, in recent years, intercropping of MECs (mainly pepper and coffee) in coconut fields has been increasing. Cropping of vegetables and other upland crops is limited to home gardens.

The area cropped with coconut totals 73,000ha, which is 17% of the total cropped land in the District. Total district production ranks 2nd in the nation, at around 384 million nuts.

Rice is double cropped in the Yala and Maha seasons. Cultivation is mainly rainfed, and the cropped area fluctuates depending on rainfall. In the Maha season, roughly 100% of paddy fields are cultivated, while the cropping rate in the Maha season is 70-90%. Unit yield over the past 5 years (1984-1988) is 3.2t/ha in the Maha season and 2.9t/ha in the Yala.

Major upland crops are cassava, yam, sweet potato, ginger and curcuma. However, the cropped area is small.

(2) Farm Management

Types of farm management in the District are as follows:

① Paddy + upland (coconut)

② Paddy + upland (coconut) + MEC (intercropping)

③ Paddy only

④ Upland only

Type ① is predominant. This type was further classified according to size, and present income and income with the scheme were comparatively studied. Results are summarized in the table below. (Details are given in Table 4-28 and Table-4-29.)

TABLE 4-27 INCOME BY FARM SCALE

Cropping Scale (acre)	Current		With Project	
	Gross Income	Net Income	Gross Income	Net Income
Large farm (10)	35,390	17,866	209,720	144,824
Medium farm (4.0)	15,868	7,752	113,585	79,040
Standard farm (1.2)	7,051	3,222	39,423	23,649
Small farmer (0.5)	3,212	1,667	16,222	11,205
Very small farmer (0.25)	444	282	3,840	2,895

As can be seen from the table, income will increase 6-10 fold under the Project for all farm scales.

Introduction of upland crops would be limited to intercropping of pepper and coffee in coconut fields, and exclude upland cropping in paddy fields in the case of large farms, due to the size of the cultivated space. In the case of medium, standard and small farms, upland crops would be cultivated in paddy fields in the dry season, and pepper and coffee in 50% of the coconut field area.

For very small farmers (0.1ha), pepper would be introduced. Pepper has the advantages of high cash convertibility and a relatively low labor requirement with the exception of the harvest. However, such farmers would likely need to augment income from off farm sources for a sufficient livelihood. It is anticipated that employment opportunities would be present on the larger farms.

TABLE 4-28 FARM MANAGEMENT PLAN

Farm size	Land use	Area (ac)	Cropping pattern	Cropping rate	Production		Gross Production		Production cost, including labor (Rs)	Net farm income
					Net yield (t/ac)	Total production (t)	Unit cost (Rs/t)	Gross income		
Large farmer (10.0)	Paddy	2.0	(2) Maha paddy	80	1.17	1.9	4,700	8,930	4,624	4,306
			(2) Maha paddy	100	1.30	2.6	4,700	12,220	7,720	4,500
	Upland	8.0	(8) Coconut	100	890	7,120	2.0	14,240	5,180	9,060
								(Total) 35,390	(Total) 17,524	(Total) 17,866
Medium farmer (4.0)	Paddy	1.0	(1) Yala paddy	80	1.17	0.94	4,700	4,418	2,312	2,106
			(1) Maha paddy	100	1.30	1.30	4,700	6,110	3,860	2,250
	Upland	3.0	(3) Coconut	100	890	2,670	2.0	5,340	1,944	3,396
								(Total) 15,868	(Total) 8,694	(Total) 7,752
Standard farmer (1.2)	Paddy	0.5	(0.5) Yala paddy	100	1.17	0.585	4,700	2,750	1,445	1,305
			(0.5) Maha paddy	100	1.30	0.650	4,700	3,055	1,930	1,125
	Upland	0.7	(0.7) Coconut	100	890	623	2.0	1,246	454	729
								(Total) 7,051	(Total) 3,829	(Total) 3,222
Small farmer (0.5)	Paddy	0.2	(0.2) Yala paddy	100	1.17	0.234	4,700	1,100	578	522
			(0.2) Maha paddy	100	1.30	0.260	4,700	1,222	772	450
	Upland	0.3	(0.3) Coconut	100	890	445	2.0	890	195	695
								(Total) 3,212	(Total) 1,545	(Total) 1,1667
Very small farmer (0.5)	Upland	0.25	(0.25) Coconut	100	890	222	2.0	444	162	282

TABLE 4-29 FARM MANAGEMENT PLAN

Farm size	Land use	Area (ac)	Cropping pattern	Cropping rate	Production		Gross Production		Production cost, including labor (Rs)	Net farm income
					Net yield (t/ac)	Total production (t)	Unit cost (Rs/t)	Gross income		
Large farmer (10)	Paddy	2.0	(2) Yala paddy	100	1.8	3.6	4,700	16,920	6,940	9,980
			(2) Maha paddy	100	2.0	4.0	4,700	18,800	6,940	11,860
	Upland	8.0	(8) Coconut	100	1,200	9,600	2.0	19,200	6,216	12,984
			(4) Pepper	(50)	0.43	1.72	60,000	103,200	24,300	78,900
			Coffee		0.30	1.20	43,000	51,600	20,500	31,100
								(Total) 209,720	(Total) 64,896	(Total) 144,824
Medium farmer (4.0)	Paddy	1.0	(1) Yala paddy	100	1.8	1.8	4,700	8,460	3,470	4,990
			(1) Maha paddy	100	2.0	2.0	4,700	9,400	3,470	5,930
			(1) Dry season upland crops	100	4.5	2.25	9,500	21,375	6,940	14,435
			(Okra)	(50)	2.8	1.40	6,500	9,100	1,735	7,365
			(Beans 0.5)	(50)						
	Upland	3.0	(3) Coconut	100	1,200	3,600	2.0	7,200	2,340	4,860
			(1.5) Pepper	(50)	0.43	0.645	60,000	38,700	9,000	29,700
			Coffee		0.30	0.450	43,000	19,350	7,590	11,760
								(Total) 113,585	(Total) 34,545	(Total) 79,040
Standard farmer (1.2)	Paddy	0.5	(0.5) Yala paddy	100	1.8	0.9	4,700	4,230	3,470	760
			(0.5) Maha paddy	100	2.0	1.0	4,700	4,700	3,470	1,230
			(0.5) Dry season upland	100						
			crops (Okra)	(50)	4.5	1.125	9,500	10,688	3,470	7,218
			(Beans 0.25)	(50)	2.8	0.70	6,500	4,550	868	3,682
	Upland	0.7	(0.7) Coconut	100	1,200	840	2.0	1,680	546	1,134
			(0.35) Pepper	(50)	0.43	0.151	60,000	9,060	2,143	6,917
			Coffee		0.30	0.105	43,000	4,515	1,807	2,708
								(Total) 39,423	(Total) 15,774	(Total) 23,649
Small farmer (0.5)	Paddy	0.2	(0.2) Yala paddy	100	1.8	0.36	4,700	1,692	694	998
			(0.2) Maha paddy	100	2.0	0.40	4,700	1,880	694	1,186
			(0.2) Dry season upland	100						
			crops (Okra 0.1)	(50)	4.5	0.45	9,500	4,275	1,388	2,887
			(Beans 0.1)	(50)	2.8	0.28	6,500	1,820	347	1,473
	Upland	0.3	(0.3) Coconut	100	1,200	360	2.0	720	234	486
			(0.15) Pepper	(50)	0.43	0.065	60,000	3,900	900	3,000
			Coffee		0.30	0.045	43,000	1,935	760	1,175
								(Total) 16,222	(Total) 5,017	(Total) 11,205
Very small farmer (0.5)	Upland	0.25	(0.25) Coconut	100	1,200	300	2.0	600	195	405
			(0.125) Pepper	50	0.43	0.054	60,000	3,240	750	2,490
								(Total) 3,840	(Total) 945	(Total) 2,895

4-4-6 Scheme for Improvement of Agricultural Supporting System

Main existing agricultural support agencies are as follows:

① Extension Section, Agriculture Department, Ministry of Agricultural Development and Research:

- Extension of cropping technology (paddy, upland)
- Distribution of good quality seed

② Agrarian Services Department, Ministry of Agricultural Development and Research:

- Guidance in fertilizer application and water management
- Provision of fertilizers and agro-chemicals
- Land registration, collection of land taxes

③ Agriculture Development Authority:

- Coordination of agricultural administration
- Supervision of farmer services
- Farmer protection

Other agencies such as the Coconut Cultivation Board, Minor Export Crops Department, and farmer financing institutions carry out independent extension activities.

Extension and support activities are carried out primarily through the 26 Agrarian Services Centers in the District. The centers have been constructed by the Agrarian Services Department, and house offices of permanent representatives from the Agrarian Services Department, Minor Export Crops Department, Agriculture Department, Coconut Cultivation Board, Agricultural Development Authority, and in some cases farmer financing institutions.

The ASC is managed by an operating committee composed of 8 government officials and 6 farmer representatives. Each season, the committee formulates cultivation, fertilizer and agro-chemical plans and coordinates the administrative activities of the concerned agencies.

A major activity of the ASC is the distribution to farmers of good quality paddy seed from the Agriculture Department, and fertilizer and agro-chemicals from the

Agrarian Services Department. As distribution of seed and fertilizer is concentrated in the the 2 planting seasons, storage facilities and transport vehicles are necessary.

Distribution of seed and fertilizer is as follows:

① Seed: national seed farm —(by train)→ Gampaha station —(by truck)→ central storehouse (new construction)

—(by truck)→ ASC Storehouse —(by 2W tractor)→ Farmer

② Fertilizer, agro-chemicals: national storehouse (Hunupitiya) —(by truck)→ ASC Storehouse

—(by 2W tractor)→ Farmer

To achieve the above, 6 fertilizer storehouses, 8 seed storehouses 2 trucks and 52 2W tractors (2 per ASC) are to be provided. Also, 3 jeeps, 26 motorbikes and 5 pickups are to be provided for administrative purposes.

As in the past, technical guidance is to be rendered by a subject matter officer from the Agriculture Department and a Technical Officer from the Agrarian Services Department.

The Agriculture Development Authority (ADA) coordinates the activities of the various agriculture related agencies in the District and monitors services provided to farmers. ADA will play an important role in monitoring the effects of the subject Project as well.

It is the aim, through organization strengthening as set out above, to improve services to farmers and contribute to increased farm production. Under the ATT Scheme, new cropping techniques developed at model farms will be extended to farmers, and demonstration will be performed at the ATT Center and the MEC nursery center for the benefit of farmer groups.

4-4-7 Scheme for Improvement of Agricultural Training

(1) Status of Current Agricultural Facilities

The District Training Centers at Walpita and Ambepussa were both constructed during World War II as army barracks. Subsequently, Walpita was converted into a girls' high school and Ambepussa into a boys' high school until 1972. The high schools were then moved to new facilities, and the old facilities were used as training centers under the Training and Education Section of the Agriculture Department.

The facilities, which were constructed during the 1940's are superannuated and are no longer fulfilling their originally intended function.

Training at the DTC's for 1983-1987 is was follows.

TABLE 4-30

	Farmers[1]	Youth[2]	Extension officers[3]	Others[4]	Training mandays
1983					
Walpita	27	236		641	12,659
Ambepussa	46	81		307	4,924
Total	73	317		948	17,583
1984					
Walpita		186		689	10,026
Ambepussa	93	79		126	6,556
Total	93	265		815	16,582
1985					
Walpita	30	44		1,085	5,203
Ambepussa	336	76		198	3,360
Total	366	120		1,283	8,563
1986					
Walpita	130	70		1,508	9,854
Ambepussa	924	19		251	3,294
Total	1,054	89		1,759	13,148
1987					
Walpita	20	389	236	697	10,290
Ambepussa	1,153	74	250	320	4,401
Total	1,173	463	486	1,017	14,691

Note 1: Farmers are trained in cultivation technology in the 1-3 day courses.
Note 2: Young farmers or school-leavers are instructed on the subject of self-employment through agriculture, mainly in the 3-month courses.
Note 3: In 1-3 day courses on the specific subject.
Note 4: Others consist of NGO workers, teachers in agriculture from the Education Ministry, etc. Mostly 1-3 day courses.

Courses range from 1-3 days, 1-3 weeks and around 3 months. Lodging for students is required in most cases. Courses are broadly grouped as follows.

Student	Term	Contents
Farmers, extension workers	1-3 days	Necesary cropping techniques for the coming season
Farm machinery owners	1 week	Machinery operation and maintenance
Women	1-3 weeks	Home economics, home gardening
Youth	1-3 months	General agriculture, modern farm management, farm product processing

A 2-3 month course for young farmers has been established to teach basic agriculture. Other subjects given focus in recent years are:

-- Intercropping of fruit and MEC's in coconut field

-- Seedling production (production of good seedlings by contract farmers)

-- Livestock husbandry (chickens, cattle, hogs)

-- Agriculture related businesses

-- MEC cultivation

-- New paddy cropping techniques

-- Dry season cropping in paddy fields (general upland crops, vegetables)

-- Operation and maintenance of farm machinery

-- Home economics, handicrafts

-- Bee keeping and home gardening

-- Export oriented farming, fruits

Farmer desire to participate in the training programs is high. However, lack of adequate dormitory space for students places a serious constraint on enrollment. Walpita DTC can accommodate only 40 persons and Ambepussa DTC only 20 persons. Young graduates of the 2-3 month basic agriculture course often wish to continue on

with other more specialized courses, but cannot do so because of the limited accommodations.

(2) Training Demand

Public education through the college level is free in Sri Lanka. The rate of continuation on to college is 18%, being constrained in part by limited student vacancies. The enrollment rate in Gampaha District for 10-14 year olds is 89%. However, it drops to 47% for 15-19 year olds. The remaining 53% drop out.

Public vocational training programs outside the DTC's are extremely limited. The rural population of 15-19 year olds is 105,000 in the District. Of these, 63,000 (60%) do not attend school. This is an average 12,600 persons per age within the said group. The Walpita and Ambepussa DTC's aim to be able to accommodate about 5% of this number, or 630, at their facilities for the 2-3 month basic course.

The current staff at each DTC is 1 farm manager, 3 trainers and 4 KVSN. In order to most effectively apply this limited staff, a training program has been formulated. The plan will expand facilities, but not staff. The envisioned facility scale is 2 classrooms at each center and dormitory capacity for 120 at Walpita and 100 at Ambepussa. Current facilities at the DTC's are 1 classroom each and dormitory capacity for 40-50 at Walpita and 35 at Ambepussa, and accordingly need to be strengthened.

(3) Training Plan and Its Relationship to the IRDP

It is recommended that mid to long-term courses be established at the DTC's for water management, intercropping and MEC cropping techniques to augment the 1-day guidance at the 2 ATT Center farms and the MEC farm. This is necessary for extension of the basic cropping technology necessary to make the IRDP successful.

The figure below shows the initial year training plan. According to this, Walpita will be able to accommodate 120-140 students, and Ambepussa 100-120 (one portion not to live on campus).

Training man-days in the initial year would be 25,000 at Walpita and 16,000 at Ambepussa. About 400 youths would be trained annually under the 2-3 month basic course.

DTC's will function as follows in achieving the basic objectives of IRDP.

-- Mid and long-term (1 week to 3 months) training to promote extension of optimum cropping techniques for wet zone to be developed under the ATT Scheme.

-- Basic training to promote extension of MEC cropping

- Addressing of the serious social problem of school drop outs, and preparation of human resources to respond to the increased employment opportunities anticipated under the IRDP.

- Training of young future farmers who will shoulder Gampaha agriculture in the years to come.

4-4-8 Operation and Maintenance Costs

Under the subject IRDP, procurement of equipment and materials is for the existing organizations, with the exception of the Agricultural Technology Transfer Scheme. Therefore, total costs for operation and maintenance are calculated as increments, except those for the new scheme and new farms. The incremental costs for the first fiscal year are as follows:

TABLE 4-31

INCREMENTAL COST FOR OPERATION AND MAINTENANCE
Annual Cost in Thousand Rupees

	Personnel	Vehicle	Equipment	Other cost	Total
Project Office		329.01		200.00	529.01
ATT Scheme	957.15	276.46	541.65	600.00	2,375.26
MEC Scheme	351.90	203.58	276.23	950.00	1,781.71
ASS Scheme		984.12			984.12
DTC Scheme		75.35	130.00		205.35
MMI Scheme		56.19	6.00		62.19
Total	1,309.05	1,924.73	953.88	1,750.00	5,937.65

The above costs for the Project operation period (i.e., 5 years after the handing over) shall be borne by the IRDP budget of the Ministry of Plan Implementation. The handing over shall be carried out as soon as the operating body is ready.

Breakdown of the above table is shown on the following pages.

PERSONNEL COST FOR OPERATION AND MAINTENANCE
Incremental Cost in Thousand Rupees

Personnel	No.	Unit cost per Month	per Year	Total Cost
ATT Center				
Publicity officer	1	6.00	72.00	72.00
Administrative office	5	4.00	48.00	240.00
Mechanic	1	3.00	36.00	36.00
Machine operator	2	2.50	30.00	60.00
Storekeeper	1	2.50	30.00	30.00
Audio-visual	1	3.00	36.00	36.00
Farm & computer	1	4.00	48.00	48.00
ATT Center Total	12			522.00
Ambepussa Farm				
Machine operator	1	2.50	30.00	30.00
Mechanic	1	3.00	36.00	36.00
Driver	2	2.50	30.00	60.00
Clerk	1	3.75	45.00	45.00
Permanent labor	15	1.20	14.40	216.00
Watcher	1	1.20	14.40	14.40
Casual labor		450 Man-day per Year		33.75
Ambepussa Total	21			435.15
MEC Farm				
Machine operator	1	2.50	30.00	30.00
Mechanic	1	3.00	36.00	36.00
Driver	2	2.50	30.00	60.00
Clerk	1	3.75	45.00	45.00
Permanent labor	10	1.20	14.40	144.00
Watcher	1	1.20	14.40	14.40
Casual labor		300 Man-day per Year		22.50
MEC Farm Total	16			351.90

OTHER RECURRENT COST FOR OPERATION AND MAINTENANCE
Incremental Annual Cost in Rupees

IRD Project Office

	No.	Fuel	Others	Total
Vehicles				
Mini-bus	2	51,840	41,472	
Jeep	2	67,886	54,309	
Audio-visual car	1	13,500	100,000	
Vehicle Total		133,226	195,781	329,006
Other cost				200,000
Total Incremental Cost				529,006

ATT Center

	No.	Fuel	Others	Total
Vehicles				
Jeep	4	135,771	108,617	
Motor-bike	3	17,820	14,256	
Vehicle Total		153,591	122,873	276,465
Machinery				
4-wheel tractor	2	162,600	243,900	
2-wheel tractor	2	48,780	73,170	
Other machinery		11,000	2,200	
Machinery Total		222,380	319,270	541,650
Other cost				600,000
Total Incremental Cost				1,418,115

MEC Scheme

	No.	Fuel	Others	Total
Vehicles				
Jeep	1	33,943	27,154	
Pickup	1	30,857	24,686	
Truck	2	36,422	29,138	
Motor-bike	2	11,880	9,504	
Vehicle Total		113,102	90,482	203,584
Machinery				
4-wheel tractor	1	81,300	121,950	
2-wheel tractor	1	24,390	36,585	
Other machinery		10,000	2,000	
Machinery Total		115,690	160,535	276,225
Other cost				950,000
Total Incremental Cost				1,429,809

ASS Scheme

	No.	Fuel	Others	Total
Vehicles				
Jeep	3	101,829	81,463	
Pickup	5	154,286	123,429	
Motor-bike	26	0	0	
Truck	2	8,780	7,024	
2-wheel tractor	52	202,925	304,387	
Vehicle Total		467,819	516,303	984,122
Other machinery		0	0	0
Total Incremental Cost				984,122

DTC Scheme

	No.	Fuel	Others	Total
Vehicles				
Jeep	2	33,943	27,154	
Motor-bike	4	7,920	6,336	
Vehicle Total		41,863	33,490	75,353
Audio-visual				120,000
Other machinery				10,000
Total Incremental Cost				205,353

MMI Scheme

	No.	Fuel	Others	Total
Vehicles				
Jeep	1	21,214	16,971	
Motor-bike	2	5,940	4,752	
2-wheel tractor	1	2,927	4,390	
Vehicle Total		30,081	26,114	56,195
Other Cost		3,000	3,000	6,000
Total Incremental Cost				62,195

4-5 Technical Cooperation

(1) Background and Need for Technical Cooperation

Sri Lanka as a whole is on the verge of achieving self-sufficiency in rice production as a result of such large scale development projects such as the Mahaweli Ganga Development Program. Gampha District, however, still remains dependent on food from outside. Rice production in the District is below the national average.

Insufficient water management results in alternate drought and inundation damage to crops, and reliance on rainfed cultivation. In addition, farmers are unfamiliar with modern cropping techniques.

Religious factors contribute to a proclivity for plants as the basic nutritional source. Although rice is in a trend towards self-sufficiency, production of grains, potato, protein sources such as beans, etc., remain low and imports are relied upon for a sufficient supply.

The Project aims to increase farm income and employment opportunities through the effective use of paddy and upland field. To achieve this, an intensive cropping model farm and improved drainage model farm will be constructed at Morenna, and an upland crops model farm at Ambepussa. With the exception of the improved drainage model farm, model farms will be under the direct management of the ATT Center. Cropping models developed at the farms will be extended to farmers throughout the District.

Cultivation of upland crops, both in paddy and upland fields, will be unfamiliar to most Gampaha District farmers. As a result, technical assistance has been requested from the Japanese Government.

It is felt that Japan is in a particularly good position to effectively provide such assistance due to its extensive experience in semi-rural agriculture, as agriculture in Gampaha is so characterized.

(2) Objective of Cooperation

The ATT Center under the scheme will directly administer the model farms. Management of the farms will reflect farmer participation to the extent possible to develop practical models.

Assigned experts will accordingly be engaged in practical cropping technology and farm management training.

(3) Cooperation Sector

Experts in the following 7 sectors will be assigned to the ATT center: rice cropping, upland/horticultural cropping, soil, water management, MEC cropping, farmer organization, market development. These experts will be assigned from the Ministry of Agricultural Development and Research, and the Ministry of Land and Land Development.

Cooperation in conjunction with establishment of the Center will primarily be aimed at the sectors of ① rice cropping, ② upland/horticultural cropping, ③ water management, ④ farm machinery, and ⑤ integrated guidance for the overall Project.

Once the Project is established and in operation, cooperation with regards to ⑥ market research and ⑦ post harvest will become necessary.

CHAPTER 5 BASIC DESIGN

5-1 Basic Design Orientation

(1) Design Orientation

(i) Natural Conditions

The basic design encompasses both construction and procurement of materials and equipment.

With the exception of farm equipment and vehicles, materials and equipment to be supplied will be housed inside buildings. In such case, climatic conditions in Gampaha will not pose any constraints (temperature 24°C-31°C; annual mean humidity 79%; wind speed 10km/h). Sunshine hours are 2,500/year, which is about 1.25 times the rates of Kofu and Okayama which show the highest values for Japan.

However, during the 2 hour period 12:00am to 2:00pm, temperatures are hot year-round, and construction work is not generally performed in this period. The 2 monsoon seasons (Yala: April-June; and Maha: September-November) will affect construction and are fully considered in the construction schedule of the Project. Anicut coffer dam construction and canal rehabilitation work must be performed in the dry season, and the timing of this work has been done to avoid the rainy seasons. Building construction may be performed throughout the year.

Sri Lanka is not subject to earthquakes. As a result, nonreinforced concrete construction is common. Buildings are primarily of brick. Under the Project, brick will accordingly be used as much as possible with the exception of major structural components. The design will take into consideration the sandy soil conditions (poor soil cohesion) anticipated at structure sites.

(ii) Construction Conditions

A site office will be needed when carrying out construction. The site office is to be established at the district Kacheri to reduce the time required for authorization for power and telephone work.

Generator power will be used at Morenna, Walpita and Ambepussa.

Local engineers will be employed for construction work to the extent possible. This also applies for detail design and construction supervision. This

will serve to promote smooth communication between expatriate experts and construction crews.

Heavy machinery such as backhoe, crawler crane, bulldozer, etc., will be dispatched from Japan as necessary. It is also assumed that operators will be trained Japanese due to the difficulty of procuring such in Sri Lanka.

Civil works construction materials will be procured locally. Pumps and pipe will be procured in Japan. Japanese standards will be applied to such equipment.

(iii) Operation and Maintenance

Operation and maintenance are to be performed by the Project Office. Operational capability in terms of technical aspects is discussed below.

Engineers from the Irrigation Department and the Minor Export Crop Department respectively will respond to technical aspects of the Morenna Model Irrigation Scheme and the Minor Export Crop Scheme. As technical levels of the facilities under the Scheme for Improvement of the Agricultural Supporting System and the Scheme for Improvement of the Agricultural Training System will be preserved at their original levels, technical problems are not anticipated. Since the upland crops model farm to be constructed at Ambepussa under the Agricultural Technology Demonstration and Transfer Scheme is to be managed by the ATT Center at Morenna, an office at the farm will be established to strengthen the O/M structure.

(iv) Facilities

Construction under the Project consists mainly of rehabilitation of existing structures. The service lives of the Morenna anicut (constructed in 1943) and Palu anicut (constructed in 1934) have been essentially exhausted. This is true as well for appurtenant canals and other facilities. These facilities, when rehabilitated under the Project, will serve as a model for the Attanagalu Irrigation Project under the long-term targets of the IRDP. The functions of the facilities will be restored to original levels.

Likewise, as the training facilities at Walpita and Ambepussa were constructed as army barracks during World War II and are superannuated, they will be rehabilitated.

The design and implementation of rehabilitation for the above facilities will meet Sri Lankan standards. However, additional reinforcement will be performed at particular critical points of structures beyond what they were originally.

Pump operation will be by the pumpman's clock, as in the past. No control board or timer will be included with the facilities.

(V) Construction

Construction will be carried out in 2 stages. These are as follows.

Order to commence construction as anticipated in mid-November following Exchange of Notes. Actual start of construction would be in January taking into consideration shipping and preparation. As first stage construction cannot be completed within the fiscal year, extension of the E/N would be performed in mid-March to March of the following year. First stage construction would be completed within this period.

E/N for the second stage construction would occur during the extension period for the first stage construction. As with first stage construction, extension of E/N would be done in March. However, construction under the second stage would be started 1.5 months earlier than the first stage.

The reason for this is the need to complete the main body foundation and side wall works at Morenna anicut prior to the rainy season (April-June). In this way, flood discharge overtopping the coffer dam piles would be discharged downstream over the finished concrete foundation slab and between the side walls. At this time the left bank flood sluiceway would be opened as well.

The top of the coffer dam piles would be made the same as the diversion level for the anicut. In this manner, intake at the 2 diversion works would be facilitated. In other words, water supply to paddy fields would be performed during construction without coffering and pump.

Critical path in the construction works is the coffering and main weir body work at Morenna anicut during the second stage construction work. This is to be addressed by combined use of the coffer dam and flood spillway during flooding as discussed above, and the intake method. Of particular importance is commencing the second stage construction 1.5 mos prior to the first stage.

(2) Design Criteria

(i) Irrigated Area and Irrigation Requirement

TABLE 5-1 IRRIGATED AREA

Scheme	Scheme Location and Components		Irrigated area	Remarks
ATT	Morenna	Intensive cropping model farm, improved drainage model farm	2.10	Upland cropping model farm
	Ambepussa	Upland cropping model farm	5.20	Fruits, vegetables, general upland crops, flowers
		Subtotal	7.30 ha	
MEC	Walpita	Seed farm	0.81	Pepper. coffee
		Mixed cropping farm	2.43	Pepper. coffee
		Subtotal	3.24 ha	
MMI	Morenna	Water management + Intercropping	392.3 ha	Paddy + upland
DTC	Walpita	Training farm (upland)	2.74 ha	Upland
	Ambepussa	-	-	-
TOTAL			Upland = 2.10 = 392.3 = 394.4 ha Paddy = 11.18 ha	

An observation survey for irrigation requirement has not been performed for this basic design. Design irrigation requirement is calculated using the criteria in "Design Technical Guidelines (I.D.)", and "Pilot Demonstration Farm in Mahaweli (System C)".

Domestic water requirement has been computed using Japanese standards.

(ii) Cropping Pattern and Field Water Requirement

① Crop Water Requirement

CWR = ETc

where:

CWR: monthly crop water requirement (mm/mo)

ETc: monthly evapotranspiration amount (mm/mo)
ETc = ETo × CF

ETo: monthly evapotranspiration of reference crop (mm/mo)

CF: crop factor

1) Evapotranspiration of reference crop

TABLE 5-2 MONTHLY EVAPOTRANSPIRATION

Unit: mm/month

Month	1	2	3	4	5	6	7	8	9	10	11	12	Total
Eto	120	127	158	150	163	176	191	194	191	158	110	115	1,853

2) Growth stage and crop factors

TABLE 5-3 CROPPING FACTOR

Crop		Period	Growth Stage				Total, days
		CF	Initial	Development	Mid	Late	
	135 days - 4.5 months	Days	30	40	45	20	135
		CF	1.00	1.15	1.20	0.90	
	105 days - 3.5 months	Days	20	30	30	25	105
		CF	1.00	1.15	1.20	0.90	
	90 days - 3.0 months	Days	20	25	2.5	20	90
		CF	1.00	1.15	1.20	0.90	
	75 days (Cowpea)	Days	15	20	25	15	75
		CF	0.7	0.9	1.10	1.0	
	90 days - (Ladies Finger)	Days	15	25	35	15	90
		CF	0.7	0.9	1.10	1.0	

② Field Water Requirement

Field water requirement is CWR plus percolation loss (PL) and field loss (FL), and includes the water requirement at puddling. The above is expressed in the formula below. Calculations are given in Table 5-5.

FWR = CWR + PL +FL + LP

where:

FWR: field water requirement

CWR: crop water requirement

PL: percolation loss

FL: field loss

LP: Puddling requirement

1) Percolation Loss (PL)

Put at an average 5.0mm/day in the Project area

2) Field Loss (FL)

This includes water management loss and seepage through paddy dikes. It is put at 10% of the sum of CWR and PL

3) Puddling requirement (LP)

Includes requirement for seedlings and main fields. For the Project area, this is as follows:

Plowing period: 10 days LP: 200mm

③ Design Irrigation Requirement and Design Discharge

Design irrigation requirement is FWR plus conveyance loss. Maximum irrigation requirement is adopted as the design discharge for irrigation facilities. Design irrigation requirement for canals is computed according to the following formula:

$$DIR = FWR(peak)/ 8.64 \times Ei$$

where:

DIR: diversion irrigation requirement (ℓ/s/ha)

FWR(peak): field water requirement (peak) (mm/day)

Ei: irrigation efficiency (0.90)

On the basis of monthly FWR calculations in Table 5-5, the maximum canal irrigation requirement is:

q = 2.6ℓ/s/ha (occurring during puddling in the Maha season in September)

④ Field Water Requirement (upland)

Daily water consumption for upland crops is as follows based on calculations in Table 5-4, and criteria of the Irrigation Department:

TABLE 5-4 DAILY WATER CONSUMPTION

Scheme	Location	Crop	Daily Water Consumption mm/day
MEC	Walpita	Seedlings (coffee, pepper)	1.5
		Demonstration (mixed planting and seed)	1.5
Training farm	Walpita	General upland crops, fruit	3.0
Demonstration farm	Ambepussa	General upland crops, fruit	3.0

TABLE 5-5 FIELD WATER REQUIREMENT

Month			J	F	M	A	M	J	J	A	S	O	N	D
ETo (mm/month)			120	127	158	150	163	176	191	194	191	155	110	115
	Type I (40%)		(15) 0.7	(20) 0.9	(25) 1.10	(15) 1.0	(20) 1.0	(30) 1.15	(30) 1.20	(25) 0.90	(20) 1.0	(30) 1.15	(30) 1.20	(25) 0.90
	Type II (40%)		(10) 0.7	(25) 0.9	(35) 1.10	(15) 1.0	(20) 1.0	(25) 1.15	(25) 1.20	(20) 0.9	(20) 1.0	(25) 1.15	(25) 1.20	(20) 0.9 / (15) 0.7
	Type III (20%)		(20) 0.9			(30) 1.0	(40) 1.15	(45) 1.20		(20) 0.90	(30) 1.0	(40) 1.15		(45) 1.20
	Type I		16.8 / 7.2	22.9 / 27.9	23.2 / 31.6	30.0	10.9 / 62.5	13.5 / 70.4	15.3 / 57.3	—	50.9	72.7	52.8	34.5
	Type II		11.2 / 36.0	7.6 / 46.6	23.2 / 31.6	30.0	10.9 / 62.5	70.4 / 10.6	34.4		50.9	60.6 / 12.6	35.2 / 13.2	13.8 / 5.4
	Type III		4.8 / 14.4	—	—	30.0	37.5	13.5 / 28.0	38.2 / 5.7	17.5	25.5	10.5 / 24.2	16.9 / 8.8	27.6
① CWR = ΣEtc (mm/month)			90.4	105.0	109.6	90.0	184.3	106.4	50.9	17.5	127.3	80.6	26.9	75.9
② PL (5.0 mm/day, Paddy only)			25.0	—	—	90.0	150.0	150.0	115.0	15.0	100.0	150.0	150.0	110.0
③ PL' (Field — ΣEtc × 0.5) (Paddy — (CWR+PL) × 0.1			35.6 4.4	52.5	54.8	18.0	33.4	35.6	26.6	3.3	22.7	33.1	27.7	2.7 18.6
④ LP (200 mm/month)			—	—	40	160.0	—	—	—	—	200.0	—	—	—
	Average	mm/month	155.4	157.5	204.4	358.0	367.7	392.0	292.5	35.8	450.0	363.7	304.6	207.2
		mm/day	5.2	5.3	6.8	11.9	12.3	13.1	9.8	1.2	15.0	12.1	10.2	6.9
	Peak	mm/day	5.7	5.6	10.3	17.2	12.4	13.2	12.2	1.2	20.0	12.1	10.3	9.6

Field Crops ····· Fallow

Paddy ····· Land Preparation

TABLE 5-6 FIELD WATER REQUIREMENT IN DRY SEASON

		December	January	February	March	April	
Cropping Calendar		105 Day Soya					
		110 Groundnut					
		150 Day Chillies					
Eto mm/month		115	120	129	158	150	Remarks
Kc	Soya	0.11	0.66	0.99	0.97	0.41	
	Ground nuts	0.18	0.65	0.90	0.94	0.42	
	Chillies	0.34	0.79	0.96	1.00	0.96	
FWR (EtoxKc)	Soya	0.4	2.6	4.3	5.1	2.1	
	Ground nuts	0.7	2.6	3.9	5.0	2.1	
	Chillies	1.3	3.2	4.1	5.2	4.8	
	Average	0.8	2.8	4.1	5.1	3.0	Average 3.1

TABLE 5-7 AVERAGE MONTHLY RAINFALL FOR 10 YEARS (1976-85)

Station	Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	No. of fine days	28.4	23.4	23.6	18.8	16.5	15.3	21.6	21.3	15.9	16.4	15.5	23.8
	Rainfall	58.4	81.9	131.1	235.2	425.5	267.2	96.1	140.0	213.3	319.9	368.3	150.2
	Effective rainfall	22.1	37.9	70.8	140.6	228.6	162.0	47.4	76.8	125.9	197.3	228.6	83.6
	No. of fine days	28.1	25.3	23.9	21.5	19.7	19.1	21.2	24.7	19.1	17.1	16.1	25.3
	Rainfall	54.6	53.4	184.4	201.0	251.4	202.6	84.7	86.9	161.1	341.8	328.0	104.7
	Effective rainfall	19.6	18.8	106.5	117.7	151.4	118.7	39.7	41.2	90.9	212.0	202.7	53.1

5-2 Facilities Plan

5-2-1 Facilities Under the ATT Scheme

(1) Description of Facilities

TABLE 5-8 DESCRIPTION OF FACILITIES

Location		Morenna		Ambepussa
Type of construction		Intensive model farm	Drainage improvement model farm	Upland model farm
Area		A = 2.10ha	A = 3.50ha	A = 7.7.0ha
Facility	Civil	Government owned paddy at Morenna	Private owned paddy at Morenna	Fallow land at seed farm of Agricultural Department
	Bldg	ATT office and 5 other buildings	--	Farm office and 5 other buildings
Schedule		Stage II	Stage II	Stage II

(2) Civil Works

(i) Intensive Cropping Model Farm

(a) Present Area

TABLE 5-9 CURRENT IRRIGATED AREA

* ( ) Actual paddy field & dikes & canal

	Paddy	M/C main canal	Others	Total
Area (m^2)	*24,286 m^2 (20,641)	2,218 m^2	3,721 m^2	30,225 m^2

(b) Irrigated Area: A = 2.1 ha (20,929m^2)

TABLE 5-10 DESIGN IRRIGATED AREA

	Paddy	Farm road	Canal		M/C Main Canal	Other	Total
			Irrigation	Drainage			
Area (m^2)	20,929	1,449	640	1,724	2,160	3,323	30,225

(c) Irrigation Block

Irrigated area of 2.1ha is divided into 57 blocks (A-E). Contour of each is to be based to the extent possible on traditional divisions. This will optimize the general applicability of the model.

TABLE 5-11 IRRIGATION BLOCKS

Block	A	B	C	D	E	Remarks
1	817	758	683	452	309	
2	1,000	752	555	374	681	
3	1,000	778	588	895	954	
4	1,000	816	399	1,030	1,058	
5	1,000	805		766		
6	700	906				
7	700	788				
8	700	666				
Total	5,917	6,268	2,225	3,517	3,002	20,929 m^2

5.2 Acres

(d) Irrigation and Drainage

Water source is to be the Morenna anicut. This is to be supplemented from the left bank intake upstream.

Discharge is to be diverted from the M/C main canal, to be rehabilitated under the Project, at turnouts at 2 locations. Water will then be conveyed to the field turnouts by secondary canals (300 × 300, concrete) to be constructed under the Project.

Drainage canals (base: 800; side: 1:1.0; H=0.85) are to be constructed in fields, and water drained off into the adjacent Palu Oya.

(e) Appurtenant Structures

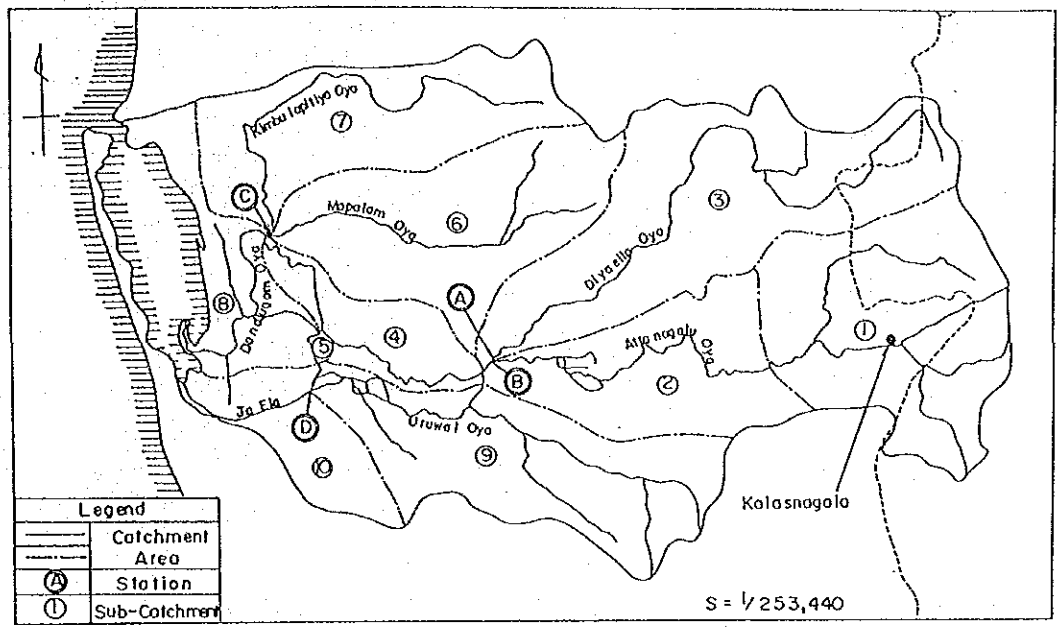
Farm roads (B=2.50m) are to be constructed inside the design fields for water management, etc. Roads will also provide access to dry yard, garage and workshop facilities.

(ii) Improved Drainage Model Farm

(a) Location

The farm is located at B in the map below. It consists of 3.50ha sandwiched between the Attanagalu and Palu oyas. Catchment area at the farm site is 195km^2. Flood discharge with a return period of 10 years is Q = 256m^3/s.

Fig.5-1 Catchment Area (Attanagalu oya)



Sub-Catchment Area

NO.	Area (km²)	River
①	94	Attanagalu Oya
②	101	〃
③	116	Diyaella Oya
④	39	Attanagalu Oya
⑤	8	〃
⑥	89	Mapalam Oya
⑦	85	Kimbulapitiya Oya
⑧	52	Dandugam Oya
⑨	102	Uruwal Oya
⑩	41	Ja Ela
Total	727	——

Station of Hydrograph

Station		Sub-Catchment Area (km²)
Ⓐ	Diyaella Oya Discharge	③ 116
Ⓑ	Diyaella Oya Confluence	①② 195
Ⓒ	Mapalam Oya Confluence	①②③④⑤ 358
Ⓓ	Punchimaeliya Amuna Anicut Confluence	⑨ 102

(b) Flood Damage

Flood discharge branches just above the site into both the Attanagalu and Palu oyas to flow by the design farm on both sides. River channel capacity at the site is as follows.

TABLE 5-12 RIVER CHANNEL CAPACITY

	Cross sectional area (m^2)	Gradient	Wetted perimeter (m)	Hydraulic mean depth (R 2/3)	Discharge velocity m/s (V)	Discharge Capacity Q (m/s)	Water surface width B (m)
Attanagalu-Oya	59.4	1/1580	23.6	1,850	1.85	110.6	20.4
PaluOya	33.0	1/1580	16.0	1,620	1.63	53.8	10.8

The above discharge capacity is based on river cross-sections just above the 2 anicuts. The relationship between the design flood level (HHFL) and embankment height (road elevation) at these anicuts is expressed in the following table.

TABLE 5-13 DESIGN FLOOD LEVEL AND BANK ELEVATION

	F. S. L (m)	H. H. F. L (m)	Low elevation	
			Right bank	Left bank
Morenna Anicut	14,478	15,392	Road 15.20	(Design farm side) 15.02
Palu-Oya Anicut	14,478	15,392	Embankment (design farm side) 15.20	15.28

As can be seen from the above, discharge will enter the farm when the design flood occurs. At present, drainage canal cross-section is insufficient for timely draining of flood discharge.

(c) Drainage Improvement Plan

Drainage will be as follows:

-- Design flood is the peak with a return period of less than 1/2 year. 1/

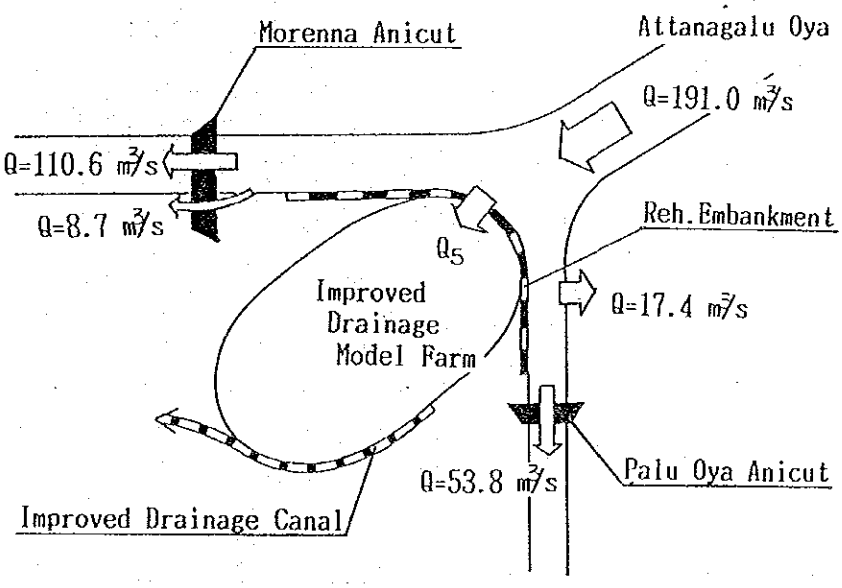
-- The above flood will overflow the 2 anicut gates, spillways and embankment.

Flood discharged will be dispersed at 5 locations in the farm and drained downstream. 2/

On the basis of the above assumptions, the following drainage improvement will be performed.

TABLE 5-14 DESIGN COMPONENTS AND EFFECT

	Scheme components	Effect
Embanking work	Design embankment height 15.20 m Design length 440 m	Prevention of flood inflow into farm to a level of 15.20 m
Terminal drainage improvement	Existing canal rehabilitation Design length 314 m	Embankment overflow and drainage countermeasure ----- (Note 3)



$Q_5 = Q - (Q_1+Q_2+Q_3+Q_4)$
$= 0.5\ m^3/s$

(iii) Upland Crops Model Farm

(a) Site

The farm site is fallow land on the Agricultural Department seed farm adjacent to the Ambepussa DTC. Total compound area is 7.70ha. Land is grassland. Irrigation facilities are absent.

(b) Design Irrigation Area

TABLE 5-15 DESIGN IRRIGATED AREA

Design crops	Design irrigated area (m^2)
Fruits	25,000
Vegetables	10,000
General upland crops	12,000
Nursery	1,000
Greenhouse	2,000
Total	52,000 m^2

(c) Water Source and Irrigation Method

Diversion is to be by pump for the Maha oya at the north of the area. Water is conveyed by pipe to a storage tank, from which it is distributed to the field by gravity. Final application is by sprinkler or furrow irrigation.

(d) Design Water Requirement

Design water requirement includes irrigation discharge, domestic water, and laundry washing water.

TABLE 5-16 DESIGN WATER REQUIREMENT

	Design features
Irrigation	A = 52,000 m²
Domestic	Population = 27 persons (farm staff)
Washing water	Jeep (1), Sprayer tractor (6), Motorbike (1)

Daily water requirement is as follows.

TABLE 5-17 DESIGN DAILY WATER REQUIREMENT

		Design features	Unit water requirement	Computation
Irrigation	Fruit	25,000 m²	3.0 m/day	25,000×3 mm×(cropping rate)= 52.5 m³
	Other	27,000 m²	3.0 m/day	27,000×3 =81.0 m³
Domestic		27 persons	285 ℓ/day	27 × 285 =10.0 m³
Washing water		Jeep × 1	350 ℓ/day/unit	1000 ℓ/day ≒ 1.0 m³
		Sprayer tractor × 6	100 ℓ/day/unit	
		Motorbike × 1	50 ℓ/day/unit	
Total		—	—	≒ 150 m³/day

(e) Storage Tank Capacity and Design Elevation

Tank capacity is to be 1/2 the design daily requirement since the water source is the Maha oya.

Capacity is :

$$150\,m^3/day \times 1/2 = 75.0\,m^3 \ (5.5 \times 5.5 \times 25\,m)$$

Tank design elevation will allow for 15m head over the highest point in the farm. Relationship between design pump intake discharge and elevation is as follows.

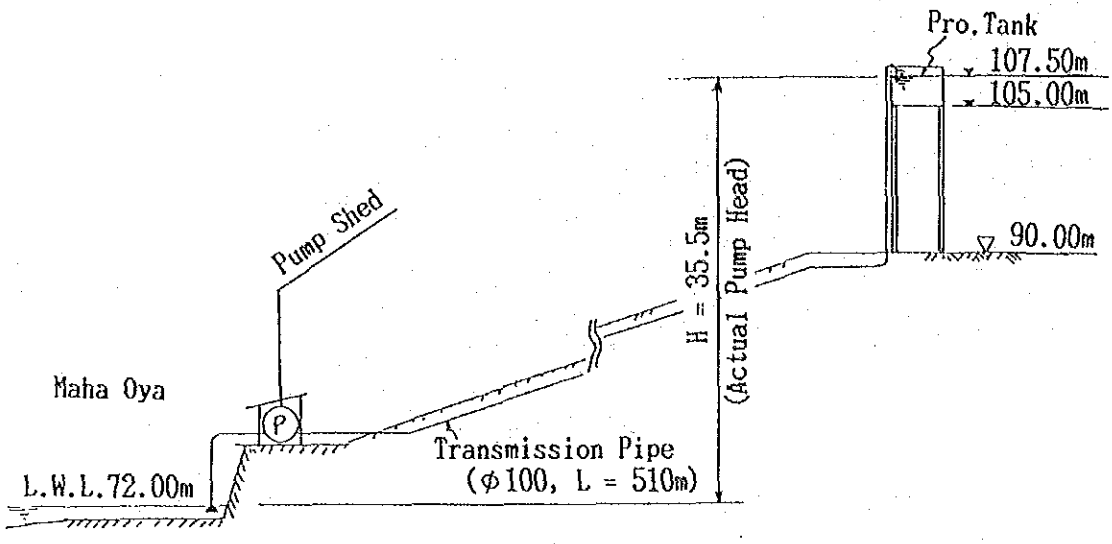


FIG. 5-2 PUMP DESIGN DISCHARGE LEVEL

(f) Pump

Discharge capacity is to be such that 1/2 of daily water requirement can be pumped in 2 hours. Two hour operation is to be performed twice daily: once in the morning and once in the afternoon. One pump unit without back-up is planned.

TABLE 5-18 PIPING PLAN SPECIFICATION

Item	Spec.	Equation
Service Pipe	Q = 0.63 m^3 / min	Q = 150 x l/2 x 1/3600 = 10.5 l = 0.63m^3 / min
Service Pipe	φ100, SOP l = 510mm	Hazen Williams Form C = 100 φ100, Hf = 34.55m / 1000m, V = 1.27 m/s
Head	H = 55.0m	= 107.5 - 720 = 35.50m } Total = 510 x 0.03455 = 17.62 } H = 55.0m Others = 1.88
Power	P = 14KW	$P = \frac{0.163 \times 063 \times 55 \times 1.2}{0.49} = 13.83 \doteq 14KW$
Pump Diameter	φ80	$D = 146 \sqrt{\frac{0.63}{200}}$

(g) Distribution

Pipe diameter is determined based on cropping pattern, irrigation method and rotation as shown below. VP pipe with minimum diameter of 50mm is to be used.

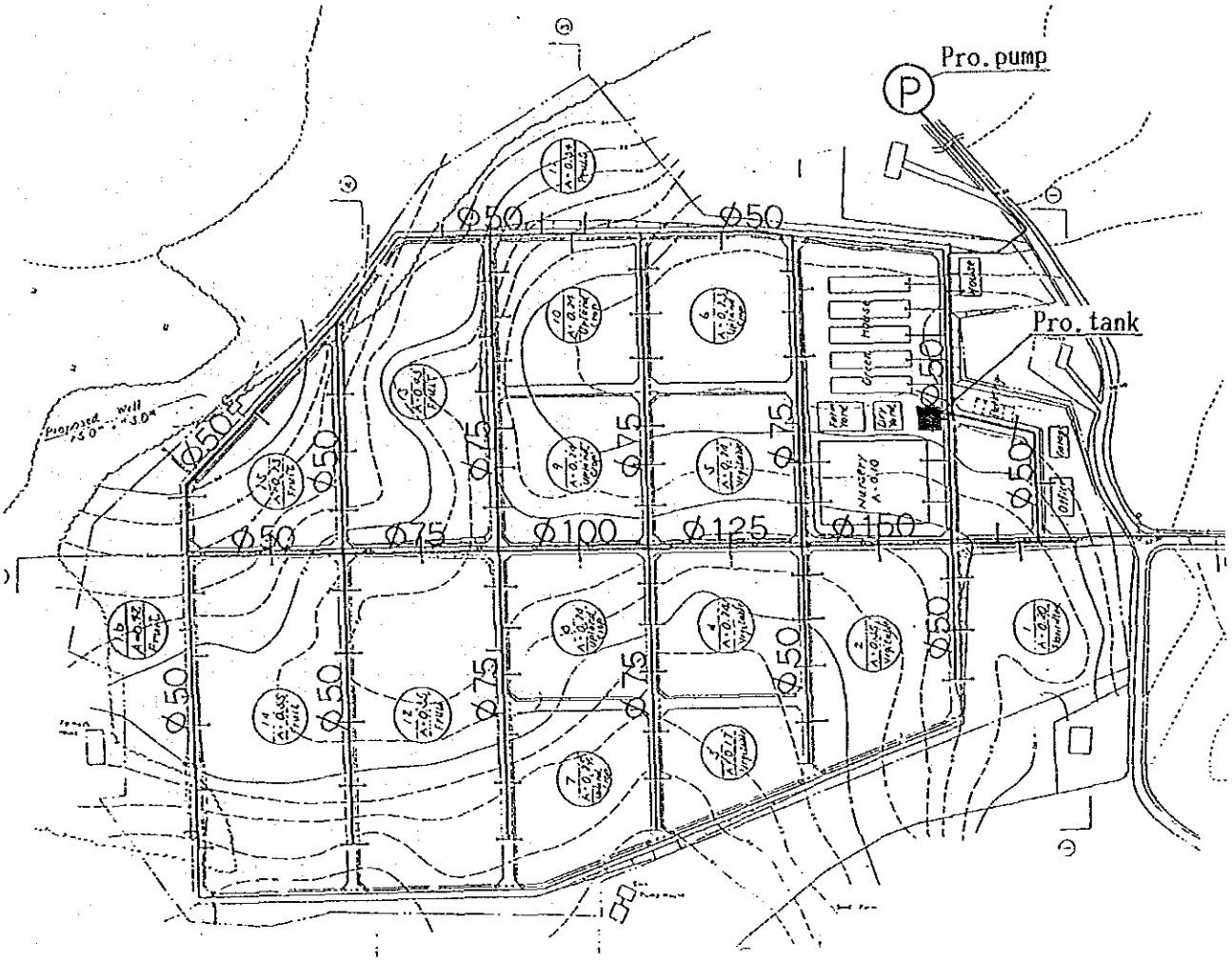


FIG. 5-3 AMBEPUSSA ATT

(3) Buildings

(i) Layout

(a) Morenna ATT Scheme Facilities

TABLE 5-19 FACILITY LIST FOR MORENNA UNDER THE ATT SCHEME

NO.	BUILDINGS	STORIES	BLD. AREAm²	FL. AREAm²	STRUCTURE	WALL	ROOF
1.	ATT CENTRE	2	430.5	772.3	RC	BRICK	ROOF TILE
2.	WATCHER'S HAT	1	4.0	4.0	RC	BRICK	ROOF TILE
3.	WORKSHOP	1	162.0	162.0	RC	BRICK	ACS
4.	WATCHER'S HOUSE(1LDK)	1	54.0	54.0	RC	BRICK	ROOF TILE
5.	GARAGE(5UNITS)	1	75.0	75.0	RC	BRICK	ACS
6.	DRY YARD	—	—	(120.0)	RC	—	—
7.	FLAG POLES	—	—	(6.8)	—	—	—
8.	PUMP HAT	1	5.0	5.0	BRICK	BRICK	ROOF TILE

Facilities are on both sides of the river at the Morenna anicut. The ATT Center main building is to be located on the side facing the main road for easy approach. The envisaged two story building is to be located at sufficient distance from adjacent paddy field to prevent effects of shade. A guardhouse will be constructed at the gate to monitor persons entering the compound as well as the nearby parking lot for staff and visitors.

The watchman's quarters will be constructed on the opposite side of the anicut. The watchman will be attentive to any irregularities occurring at the anicut at night. Farm machinery workshop, dry yard and garage are to be located at the side facing the model farm, with consideration to work efficiency.

ATT Center (1F: 395.5m^2; 2F: 376.8m^2; Total: 772.3m^2)

TABLE 5-20 ATT CENTER (GF 395.5M², 1F 376.8M², TOTAL 772.3M²)

FL	ROOM	AREA m²	C. H m	REMARKS
G	ENTRANCE	42.0		
	ENTRANCE HALL	80.5	3.5	
	GENERAL OFFICE	38.5	3.5	FOR 8 PERSONS.
	STAFF ROOM	19.25	3.5	
	IRRIGATION WATER MANAGEMENT ROOM	19.25	3.5	FOR TECHNICAL OFFICER.
	RESEARCH AND MARKETING ROOM	31.5	3.5	FOR TECHNICAL OFFICER.
	COMPUTER ROOM	14.0	3.5	
	SOIL LABRATORY	19.25	3.5	
	SOIL ROOM	19.25	3.5	FOR TECHNICAL OFFICER.
	LUNCH ROOM	19.25	3.5	
	STORE	19.25	3.5	
	CORRIDOR	35.0	3.0	
	TOILET (MALE FEMALE)	33.5	3.0	
	TER ROOM	5.0	3.0	
1	LECTURE ROOM	91.0	3.5	FOR GUIDANCE AND CONFERENCE.
	MANAGER ROOM	19.25	3.5	
	CONFERENCE ROOM	38.5	3.5	
	ASSISTANT MANAGER ACCOUNTANT ROOM	19.25	3.5	
	PADDY ROOM	19.25	3.5	FOR TECHNICAL OFFICER.
	UPLAND ROOM	19.25	3.5	FOR TECHNICAL OFFICER.
	AUDIO ROOM	38.5	3.5	
	MEC OFFICE	19.25	3.5	FOR TECHNICAL OFFICER.
	FARMER ORGANIZATION ROOM	19.25	3.5	FOR TECHNICAL OFFICER.
	CORRIDOR	42.0	3.0	
	STAIRS	51.3	3.0	

TABLE 5-21 WORKSHOP (162.0M²)

FL	ROOM	AREAm²	C.H m	REMARKS
G	WORKSHOP	139.5		FOR REPAIR AND MAINTENANCE.
	OFFICE	10.5	3.0	
	STORE	9.0		FOR EQUIPMENTS.
	TOILET	3.0	2.5	

TABLE 5-22 WATCHMAN'S QUARTERS (1LDK, 54.0M²)

FL	ROOM	AREAm²	C.H m	REMARKS
G	ENTRANCE	4.5		
	LIVING, DINING ROOM	18.0	3.0	
	BED ROOM	13.5	3.0	
	KITCHEN	9.0	3.0	
	SANITARY	5.4	2.5	
	CORRIDOR	3.6	2.5	

(b) Ambepussa ATT Scheme

TABLE 5-23 FACILITY LIST FOR AMBEPUSSA UNDER THE ATT SCHEME

NO.	BUILDINGS	STORIES	BLD. AREAm²	FL. AREAm²	STRUCTURE	WALL	ROOF
1.	FARM OFFICE	1	72.0	72.0	RC	BRICK	ROOF TILE
2.	GARAGE (3UNITS)	1	45.0	45.0	RC	BRICK	ACS
3.	WATCHER'S HOUSE (2LDK)	1	72.0	72.0	RC	BRICK	ROOF TILE
4.	SOIL TREATMENT YARD	1	150.0	150.0	S	BRICK	ACS
5.	DRY YARD	1	—	(150.0)	RC	—	—
6.	PUMP HAT	1	5.0	5.0	BRICK	BRICK	ROOF TILE

Like Morenna, Ambepussa is a model farm. Facilities include an office, garage, and watchman's quarters. Facilities will be located at the back of the DTC. Gate and guardhouse are not necessary. The office which will also serve as reception will be located at the entrance to the complex. Agricultural facilities will include soil treatment yard for fertilizer mixing and dry yard. No workshop is planned as the facility at the adjacent DTC will be available. As the farm is located at some distance from town, the watchman's quarters will be 2LDK to accommodate a family.

TABLE 5-24 OFFICE (72.0M²)

FL	ROOM	AREAm²	C. H m	REMARKS
G	OFFICE (1)	12.0	3.0	
	OFFICE (2)	12.0	3.0	
	STORE	12.0	3.0	
	TEA ROOM	6.0	3.0	
	TOILET	6.0	3.0	
	VERANDAH	24.0		

TABLE 5-25 WATCHMAN'S QUARTERS (2LDK, 72.0M²)

FL	ROOM	AREAm²	C. H m	REMARKS
G	ENTRANCE	0.8		
	LIVING. DINING ROOM	27.1	3.0	
	BED ROOM(1)	15.6	3.0	
	BED ROOM(2)	12.0	3.0	
	KITCHEN	7.5	3.0	
	SANITARY	5.4	2.5	
	CORRIDOR	3.6	2.5	

(ii) Cross Section

Floor elevation is to be a standard 300 above ground surface in consideration of rain and humidity.

Ceiling elevation is to be a standard 3000. This will allow an effective 2500 of space below the ceiling fans to be installed, as well as permit good air circulation. However, the ATT Center main building ceiling is to be 3500. Rooms not habituated people will have lower ceilings.

(iii) Structure

Their are neither earthquakes nor violent winds affecting the Project area. Winds are mostly around 5m/s to the northeast in January and to the southwest in July. Accordingly, design will account for slight wind stress and vertical stress. Soil is hard, reddish weathered granite.

Standard local construction methods will be adopted. Critical sections of main structures will be reinforced concrete, with outer walls of brick. For sheds, roof will be tile, or slate roof on rebar frame.

(iv) Facilities

Water supply: Water will be lifted by power pump from well and stored in a tank. Supply from the tank will be by gravity. Water will be distributed to toilets, wash rooms, showers, kitchens garages, and outdoor sprinkler spigots by VP pipe.

Drainage: Various waste water from buildings will be converged for drainage into a percolation type septic tank. Rainwater will be diverged by side drains to irrigated areas. All drainage will be by VP pipe.

Air Conditioning: Ceiling fans will be installed in all rooms being lived in.

Ventilation: Ventilation of inhabited rooms, bathrooms and washrooms will be natural. Louvers will be placed between windows and ceiling to promote air circulation.

Power: Power feeds will be run from the nearest high tension lines. Power supply will be run from pole mounted transformer to each building.

Lighting, sockets: Lights and sockets will be set in each room. Illumination is to be around 300ℓx.

Phone: A sleeve will be set in the outer wall of buildings for running of phone hook-ups.

TV: A TV terminal will be set in the AV room of the ATT Center. A master antenna will be installed on the roof.

(v) Construction Materials

Local construction methods will be adopted in principal. Standards for materials are to be the same as for other IRDP's in the country.

TABLE 5-26 FINISH LIST

ITEM	FINISH
ROOF	WOOD TRUSS, ROOF TILE / ASBESTOS CEMENT SHEET
DRAIN	PVC
EXTERIOR WALL	BRICK, PLASTER, PAINT
INTERIOR WALL	BRICK, PLASTER, PAINT
FLOOR	CONCRETE
CEILING	ASBESTOS CEMENT SHEET / GYPSUM BOARD
DOOR AND WINDOW	DOOR :WOOD PAINT WINDOW:WOOD PAINT, GLASS

5-2-2 Facilities Under Minor Export Crop Promotion Scheme

(1) Facility Description

TABLE 5-27 FACILITY DESCRIPTION

Location		Walpita	
Work item		Seed farm construction	Mixed cropping model farm construction
Area		A = 3.3 ha	A = 2.2 ha
		Land owned by MEC Dept. (fallow land, currently coconut fields)	same
Facility description	Civil	① Seedling farm construction ② Well, pump, pipe, tank construction	① Mixed cropping farm and seed farm construction ② Well, pump, pipe, tank construction
	Building	① Nursery bed houses, etc. ② Farm office, etc. (A = 0.74 ha)	
Schedule		PHASE I	PHASE I

(2) Civil Works

(i) Scheme Area

The Walpita MEC farm site is located between the Walpita DTC and the Coconut Research Board. The land is owned by MEC and encompasses 5.5ha. At present, one portion is coconut fields. Irrigation facilities are absent.

(ii) Design Irrigated Area

TABLE 5-28 IRRIGATED AREA

Farm	Irrigated area
Seedling farm	8,100 m²
Mixed cropping model farm and seed farm	24,300 m²
Total	32,400 m²

(iii) Design Water Requirement

TABLE 5-29 DESIGN WATER REQUIREMENT

Farm	Type of water requirement	Scheme features	Unit water requirement	Calculation
Seedling farm	Irrigation	A = 8,100 m²	1.5 mm/day	8,100 × 1.5 × 1/0.85 ≒ 15.0 (irrigation rate)
	Domestic	Staff : 25	285 ℓ/day	0.285 × 25 persons ≒ 8.0
	Washing	Jeep, Truck	350 ℓ/day	0.350 × 3 units
		Tractor, Sprayer	100 ℓ/day	0.100 × 6 units } ≒ 2.0
		Mortor cycle.	50 ℓ/day	0.050 × 2 units
	Total	—	—	≒ 25.0
Mixed cropping model farm	Irrigation	A = 24,300 m²	1.5 mm/day	24,300 × 1.5 × 0.6 ≒ 25.0 (cropping rate)

(iv) Water Source

Water source is to be one shallow well each at the seedling farm and mixed cropping model farm. Location is to be adjacent to the Coconut Research Board complex.

Water source capacity must allow for pumping of the design daily water requirement for each farm. Scale is as followsa:

TABLE 5-30 WELL SCALE

Farm	Recoverable days	Shallow well scale	Calculation
Seedling farm	1 day	25.0 m^3 (ϕ4.0m × H=4.0m)	25.0 m^3 × 1 day
Mixed cropping model farm	3 days	75.0 m^3 (ϕ6.0m × H=4.0m)	25.0 m^3 × 3 days

(v) Storage Tank

One storage tank is to be installed for each farm. Storage tank capacity is to be the design requirement for one day (V = 25m^3).

(vi) Pump

Each pump is to be operated 2 hours daily. Pump plan is as follows.

TABLE 5-31 PUMP PLAN

Farm	Item	Feature	Calculation
Seedling farm	Discharge	Q=3.5ℓ/s (0.21m^3/min)	25 m^3/day × 1/(2×60×60)
	Conveyance pipe	ϕ75, L=700 m	Hazen Willams formula C=100, Ht=1.84/100 m
	Total head	H=43.0 m	Actual head: 28.3 m 28.3+1.84×700/100 m = 41.2 m
	Output	P=4.8 kw	$P = \frac{0.163 \times 0.21 \times 43 \times 1.2}{0.37 \text{ (pump efficiency)}} = 4.77$ kw
	Pump dia.	ϕ50	$D = 146 \times \sqrt{\frac{0.21}{2.0}} = 47.3$ mm
Mixed cropping model farm	Discharge	Q=3.5ℓ/s (0.21m^3/min)	25 m^3/day × 1/(2×60×60)
	Conveyance pipe	ϕ75, L=400 m	Hazen Williams formula C=100, Ht=1.84/1000 m, V=0.68m/s
	Total head	H=40.0 m	Actual head: 29.8 m 29.8+1.84×400/100 m = 37.2 m
	Output	P=4.4 kw	$P = \frac{0.163 \times 0.21 \times 40 \times 1.2}{0.37 \text{ (pump efficiency)}} = 4.4$ kw
	Pump dia.	ϕ50	$D = 146 \times \sqrt{\frac{0.21}{2.0}} = 47.3$ mm

(vii) Irrigation Method

Distribution from the storage tank is to be by gravity. Irrigation method is as follows:

Seed farm	Hose irrigation
Mixed cropping farm	Furrow irrigation and hose irrigation

(viii) Distribution

VP pipe is to be used. In consideration of irrigation rotation, minimum diameter is to be 50mm.

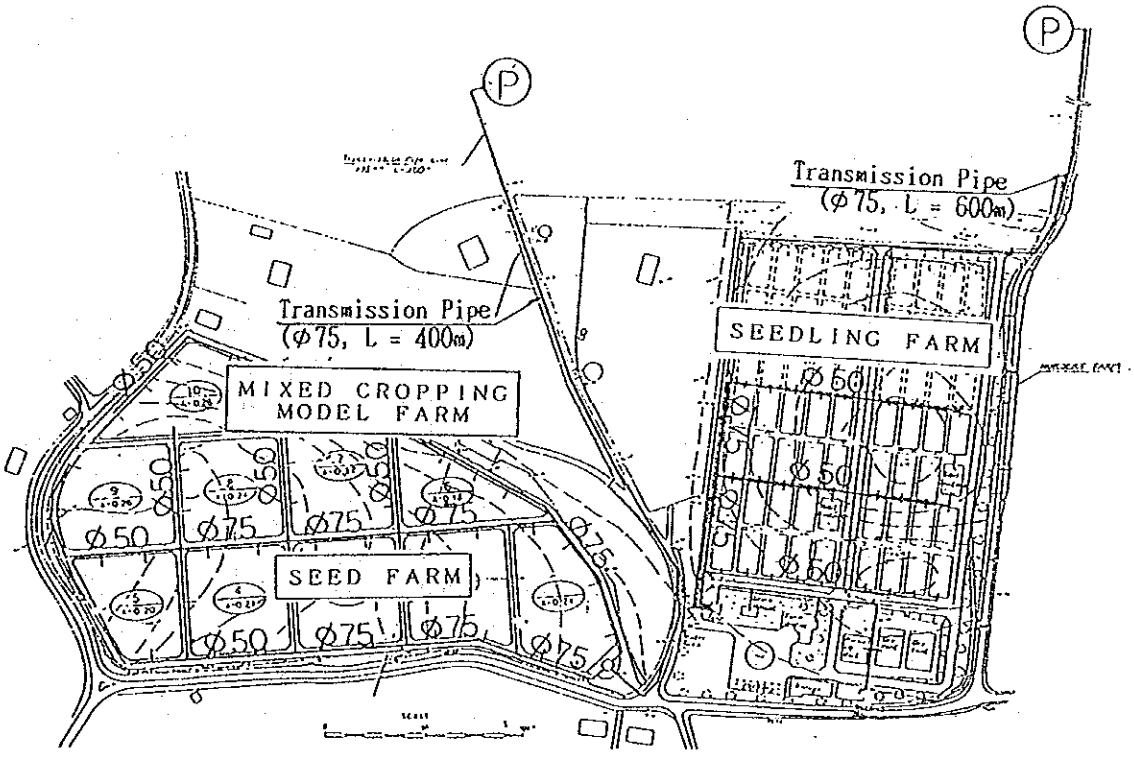


FIG. 5-4 WALPITA MEC

(3) Buildings

(i) Sites

TABLE 5-32 FACILITY LIST FOR WALPITA UNDER THE MEC SCHEME

NO.	BUILDINGS	STORIES	BLD. AREAm²	FL. AREAm²	STRUCTURE	WALL	ROOF
1.	FARM OFFICE	1	175.9	175.9	RC	BRICK	ROOF TILE
2.	WATCHER'S HOUSE(2LDK)	1	72.0	72.0	RC	BRICK	ROOF TILE
3.	GARAGE(6UNITS)	1	109.0	109.0	RC	BRICK	ACS
4.	FLAG POLES	—	—	(6.8)	—	—	—
5.							
6.	WATCHER'S HAT	1	4.0	4.0	RC	BRICK	ROOF TILE
7.	SOIL TREATMENT YARD (2UNITS)	1	150.0 ×2	150.0 ×2	S	BRICK	ACS
8.	NURSERY BED (34UNITS)	1	223.7 ×34	223.7 ×34	S	NET	NET
9.	DRY YARD(2UNITS)	1	228.0 ×2	228.0 ×2	RC	—	—
10.	PUMP HAT(2UNITS)	1	5.0 ×2	5.0 ×2	BRICK	BRICK	ROOF TILE

The seedling production center at Walpita encompasses numerous facilities. The site area is divided into 2 sections, one for the mixed cropping model farm and the other for the seedling beds. Buildings will be sited in the seedling bed area. This area will be accordingly divided into 3 blocks: administrative and teaching area, work area and seedling beds. Gate, guardhouse, farm office, garage, and parking space will be set in one corner closest to the DTC center on the main road, to front on a court yard with flag pole in the center. This is in consideration of easy access.

Adjacent will be a work area consisting of dry yard, processing unit.

Further inside the area will be 34 seedling bed houses, and 2 soil treatment yards for fertilizer mixing.

TABLE 5-33 FARM OFFICE (175.9M²)

FL	ROOM	AREAm²	C.H m	REMARKS
G	LOBBY	18.4	3.0	
	LECTURE ROOM	54.0	3.0	FOR GUIDANCE AND DISPLAY.
	OFFICE(1)	13.5	3.0	FOR MANAGER.
	OFFICE(2)	13.5	3.0	FOR TECHNICAL OFFICER.
	LUNCH ROOM	13.5	3.0	
	GENERAL OFFICE	27.0	3.0	
	CORRIDOR	18.0	3.0	
	TOILET	18.0	3.0	

TABLE 5-34 WATCHMAN'S QUARTERS (2LDK, 72.0M²)

FL	ROOM	AREAm²	C.H m	REMARKS
G	ENTRANCE	0.8		
	LIVING.DINING ROOM	27.1	3.0	
	BED ROOM(1)	15.6	3.0	
	BED ROOM(2)	12.0	3.0	
	KITCHEN	7.5	3.0	
	SANITARY	5.4	2.5	
	CORRIDOR	3.6	2.5	

5-2-3 Facilities Under Morenna Model Irrigation Scheme

(1) Site Area

TABLE 5-35 SITE DESCRIPTION

Location		Morenna			Palu Oya	
Work item		Morenna anicut rehabilitation	Canal rehabilitation	Drainage canal rehabilitation	Palu Oya anicut rehabilitation	Canal rehabilitation
Scheme scale		Diversion discharge $Q = 0.69\ m^3/s$	Irrigated area $A = 265.2\ ha$	Catchment area $A = 2.2\ km^2$	Diversion discharge $Q = 0.33\ m^3/s$	Irrigated area $A = 127.1\ ha$
Facility description	Civil	· Existing anicut rehabilitation {5 gates, flood spillway, embankment protection}	· Existing irrigation canal rehabilitation · Access road {R/B canal, Middle canal}	· Existing drainage canal rehabilitation ($\ell = 1900^m$) (Cross section modification)	· Existing anicut rehabilitation {2 gates, flood spillway, embankment protection}	· Existing irrigation canal rehabilitation (L/B canal)
	Building	—	—	—	—	—
Schedule		PHASE II			PHASE I	

(2) Description

The scheme aims to introduce upland crops into paddy fields during the dry season (January-March). Discharge of the Attanagalu Oya drops to a low water level during this period due to lack of rainfall.

The Morenna and Palu oya anicuts, and irrigation canal will be rehabilitated under the scheme. An O/M road (B=2.50m) will be added alongside the canal. Rehabilitated facilities will be used for irrigated cropping of both paddy and upland crops in lowland fields. It is the target of the scheme that such cropping will gain support among farmers in the area and attain levels to be demonstrated at the intensive cropping model farm (A = 2.1ha).

(i) Morenna

TABLE 5-36 DESIGN DESCRIPTION

	Item			Quantity		Remarks		
Anicut	Main body			5 gates, 1 set		2100 x 1840 x 4 gates, 3600 x 1840 x 1 atte		
	Flood spillway			B = 17.50 m		Fixed weir type		
	Embankment protection			EL = 146 m		Stone masonry		
	Removal works			1 set		Existing headworks, concrete		
	Temporary works			1 set		Two lines of coffering pile, access		
Canal and Related Structures	R/B Main Channel and M/C Main Channel	Canal	Lining	①450m	②(1802) m	① + ② 4,802	< 1,012.5>	
			Earth Canal	450m	(928)	1,378	< 305.5>	
			F / C	3,489m	(200)	3,689	< 570>	
		Related Structures	Division work	8	(6)	14	< 6>	
			Turnout	3	(1)	- 4	-	
			Drainage canal crossing works	3	(4)	- 7	< 2>	
			Drop works	3	(1)	4	-	
			Bathing place	1	(5)	2	-	
			Over bridge	1	(5)	6	-	
			Pipe aquaduct	4	(1)	5	<2>	
			Road crossing structures	1	-	2	-	
			O/M road	3,000m	-	3,000	<750>	
			Measurement facility	1	-	1	<1>	
			Spillway	-	(1)	1	-	
Drain -age	Reform of canal section			1,900m		Earth canal		

(ii) Palu Oya

TABLE 5-37 DESIGN DESCRIPTION

	Item			Quantity		Remarks
Anicut	Main body			2 gates, 1 set		2100 x 1840 x 2 gates
	Flood spillway			B = 5.0 m		Fixed weir type
	Embankment protection			EL = 74 m		Stone masonry
	Removal works			1 set		Existing headworks, concrete
	Temporary works			1 set		Two lines of coffering piles, access
Canal and Related Structures	L/B Main Channel	Canal	Lining	3, 100m	-	
			Earth Canal	-	800	
			F / C	4,590	1,080	
		Related Structures	Division work	7	3	
			Turnout	-	-	
			Drainage canal crossing works	3	-	
			Drop works	3	-	
			Bathing place	1	-	
			Over bridge	7	-	
			Pipe aquaduct	3	-	
			Road crossing structures	-	-	
			O/M road	1,929	-	
			Measurement facility	1	-	
			Spillway	1	-	

(3) Design Scale

(i) Irrigated Area

Targeted irrigated area is 392.3ha. Anicuts, canal and irrigated area are as follows.

TABLE 5-38 IRRIGATED AREA BY ANICUT

Headworks / Canal / Area	Morenna anicut		Palu Oya anicut	Total
	R/B	M/C	L/B	
Irrigated area	233.1	32.1	127.1	392.3 ha
Rate	59%	9%	32%	100 %

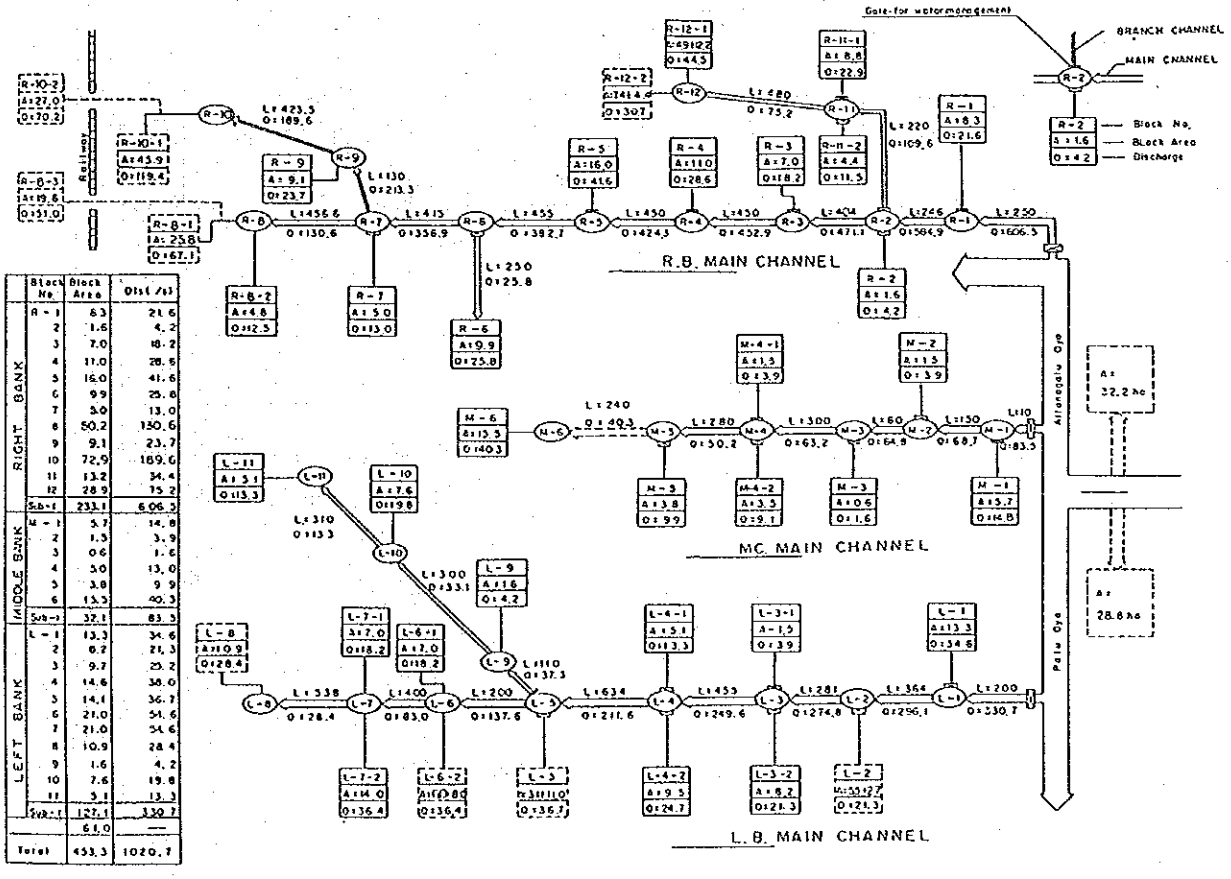


FIG. 5-5 DIAGRAM OF PROPOSED IRRIGATION SYSTEM IN THE MORENNA AREA

(ii) Anicut Rehabilitation

(a) Present Status

① Location of Catchment and Design Hydrograph

Location of anicut catchment area is as shown in Fig.-6. Catchment area size is 195km^2.

The design hydrograph is computed from the unit hydrograph using 3 day continuous rainfall, and with reference to the runoff hydrograph for nearby river. (see Fig. 5-7)

② Relationship Between Attanagalu Oya and Anicut Rehabilitation Works

The greater Attanagalu Oya catchment area comprises 3 subcatchments and 34 existing anicuts. There are currently 10 projects planned for anicut rehabilitation as shown in Table 5-39. The anicuts under the Project are included in the Attanagalu subcatchment.

TABLE 5-39 ANICUTS IN GREATER ATTANAGALU OYA CATCHMENT

Subcatchment	No. of Schemes	Existing Anicuts	Irrigated Area
Diyaella Oya	4	13	1,555ha
Attanagalu Oya	4	11	1,476
Uruwalu Oya	2	10	839
Total	10	34	3.870

Breakdown of the Attanagalu Oya subcatchment is shown in Table 5-40. Anicut works under the Project are included in the Morenna scheme.

TABLE 5-40 PROJECTS IN THE ATTANAGALU OYA SUBCATCHMENT

	Project	Irrigated Area	No. of Anicuts
Attanagalu Oya	Morenna	453ha	3
	Kettawala	623	3
	Thammita	319	4
	Opatha	81	1
Total	4	1,476	11

③ Features of Existing Anicuts

Features of anicuts in the Project area included in the Morenna scheme are shown in Table 5-41.

TABLE 5-41 EXISTING ANICUT FEATURES

Anicut	Year Built	Anicut Elevation			Irrigated Area		Diversion Works	
		HHFL	FSL	SILL			Diversion Discharge	SILL EL1/
Morenna	1943	15.392	14.478	12.344	R	210.0	0.98m3/s	13.44
					L	44.1		13.98
Palu Oya	1934	15.392	14.478	12.344	R	0	No record	13.57
					L	124.2		
Patha Kada	1974	13.868	13.106	11.735	R	0	1.74	12.92
					L	74.9		

1/ Only sill elevations are actually recorded values. Other features are based on data from the Irrigation Department

④ River Features at Anicut Sites

River features at anicut sites are as follows.

TABLE 5-42 RIVER FEATURES AT ANICUT SITES

Anicut	A (m^2)	I	P (m)	$R^{\frac{2}{3}}$ (m)	V (m/s)	Q (m^3/s)	B_1 (m)
Morenna	59.4	1/1580	23.6	1.850	1.85	110.6	20.4
Palu Oya	33.0	1/1580	16.0	1.620	1.63	53.8	10.8
Pathakada	47.4	1/1580	17.8	1.921	1.93	91.5	12.3

⑤ River Profile at Anicut Sites

River profiles at Morenna and Palu Oya anicuts are shown in Fig. 5-8.

(b) Design Criteria

① Anicuts Under the Project

Morenna and Palu Oya anicuts are to be rehabilitated under the Project. Pathakada anicut is excluded from the Project. (see Fig. 5-9)

② Design Irrigated Area and Design Intake Discharge

TABLE 5-43 DESIGN IRRIGATED AREA AND DESIGN INTAKE DISCHARGE

Anicut	Main Canal	Design Irrigated Area	Design Intake Discharge	Design Intake Level
Palu Oya	M/L	127.1	0.33	14.478
Morenna	M/R	233.1	0.61	14.478
	M/C	32.1	0.08	
Total		392.3	1.02	

③ Design Flood Discharge and Level

Table 5-44 Design Flood Discharge and Level

Anicut	Design Flood Discharge (m^3/s)	Design Flood Level (m)	Remarks
Palu Oya	50	15.392	Flood discharge is determined based on present river flow bearing capacity.
Morenna	146	15.392	Flood discharge is determined based on present river flow bearing capacity.

④ Design Location

Anicuts are to be relocated slightly upstream of current sites.

Palu Oya: 5.0m upstream of existing gate center

Morenna: 9.0m upstream of existing gate center

⑤ Components and Layout

Table 5-45 Components and Layout

		Components and Layout
Intake type		Weir type intake
Intake location		Directly upstream of weir. Left bank at Palu Oya, both banks at Morenna
Weir type		Floating type, totally movable
	Palu Oya	B = 2.10m × 2 gates (H = 1.84m), sluice gate
	Morenna	B = 2.10m × 4 gates (H = 1.84m), sluice gate B = 3.60m × 1 gates (H = 1.84m), 2 stage gate
Appurtenant facilities		
	Flood spillway	Palu Oya: B = 5.0m Morenna: B = 17.5m (fixed weir type)
	Bank protection	Masonry both upstream and down

⑥ Creep Length (Morenna and Palu Oya)

a. Creep Length (L)

$L = C \cdot \Delta H = 12 \times 2.5m = 30.0m$ (C = 12, coarse sand)

b. Length of Downstream Apron (ℓ_1)

$$\ell_1 = 0.6 \cdot C \cdot \sqrt{D_1} = 0.6 \times 12 \times \sqrt{2.5} = 12.0m$$

c. Length of Upstream Apron (ℓ_2)

ℓ_2 = L - ℓ_1 - (sheet pile length) = 30.0 - 12 6.0 × 2 = 6.0m

d. Apron Thickness

1. Downstream Apron Thickness (T_A)

$$T_A = \frac{4}{3} \times \frac{\Delta H - H_f}{r-1} = \frac{4}{3} \times \frac{2.5-1.7}{2.5-1} = 0.80m$$

2. Upstream Apron Thickness (T_B)

$$T_B = \frac{2}{3} \times T_A$$

e. Rip Rap Length ($L_a = L_b - \ell_1$)

$$L_B = 0.67 \cdot C \cdot \sqrt{H_a \cdot q} \times f = 0.67 \times 12 \sqrt{1.25} \times 5.4 \times 1.0 = 21m$$

$L_a = 21 - 12 = 9.0m$, $q = Q/W \doteq 5.4\ m3/s$

⑦ Operation Facilities

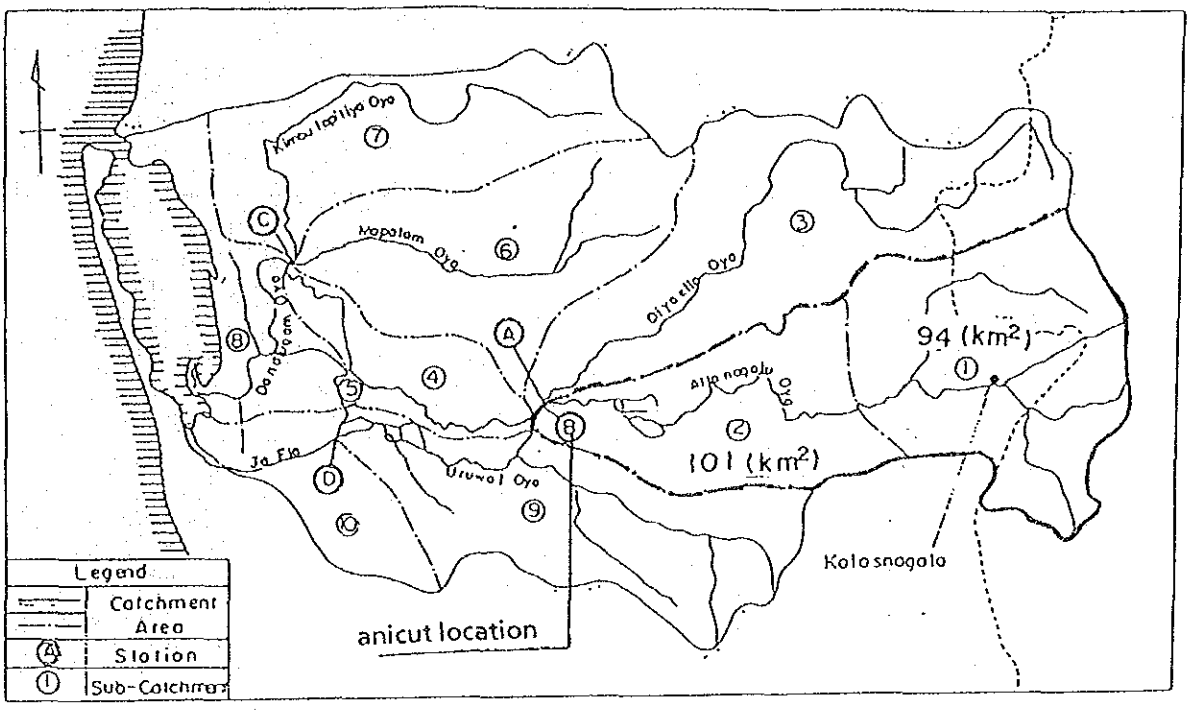
All gates are to be operated by manual winch, with the exception of the double gate at the Morenna headworks, which is to be power operated. All operational controls are to be located at the side of the gates.

Gate features are as follows.

Table 5-46 Gate Features

	Double Sliding Gate	Single Sliding Gate
Gate type	Steel sliding gate (double)	Steel sliding gate
Number	1	6
Clear span	3.6m	1.8m
Gate height	1.84m	1.84m
Design depth (front)	2.75 m (at HWL)	2.75 m (at HWL)
Design depth (back)	0	0
Operating depth (front)	2.75 m (at HWL)	2.75 m (at HWL)
Operating depth (back)	0	0
Seal type	Back rubber seal	Front rubber seal
Lift	2.96	2.96
Closing device	Power - double spindle	Manual single spindle
Closing speed	When powered: 0.3m/s	--
Operating method	From side of gate	From side of gate

FIG. 5-6 CATCHEMENT LOCATION



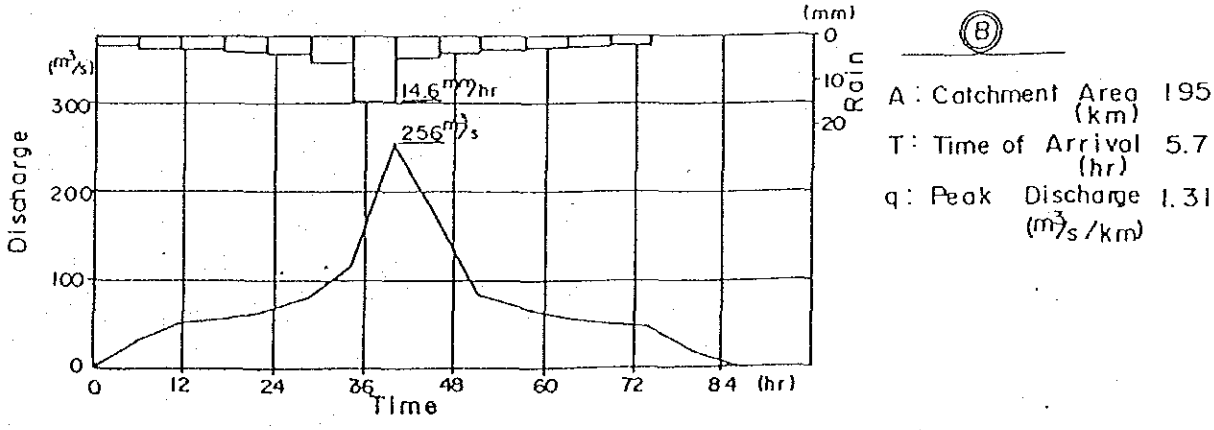


FIG. 5-7 DESIGN HYDROGRAPH (1/10 RETURN PERIOD)

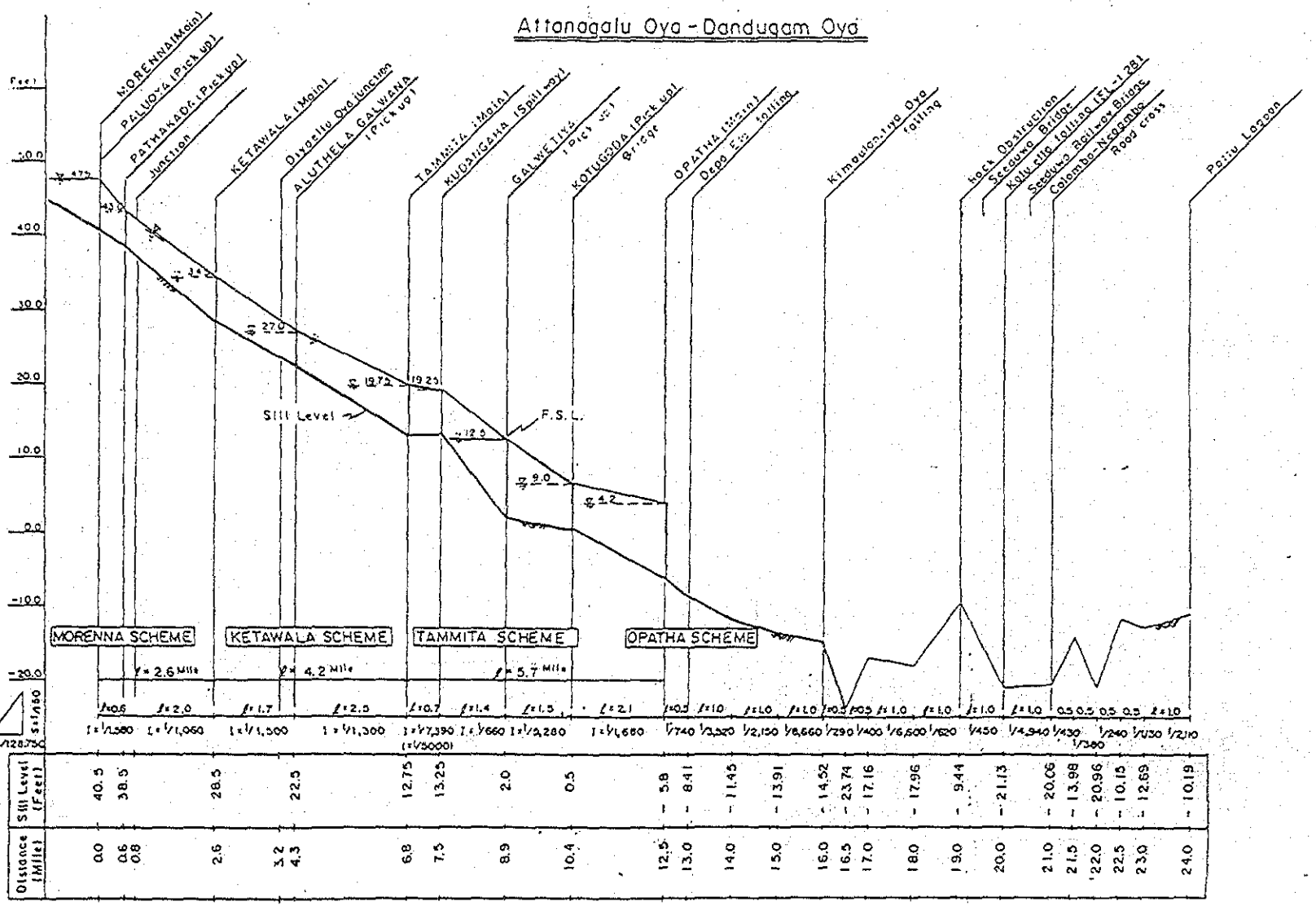


FIG. 5-8 ATTANAGALU OYA PROFILE

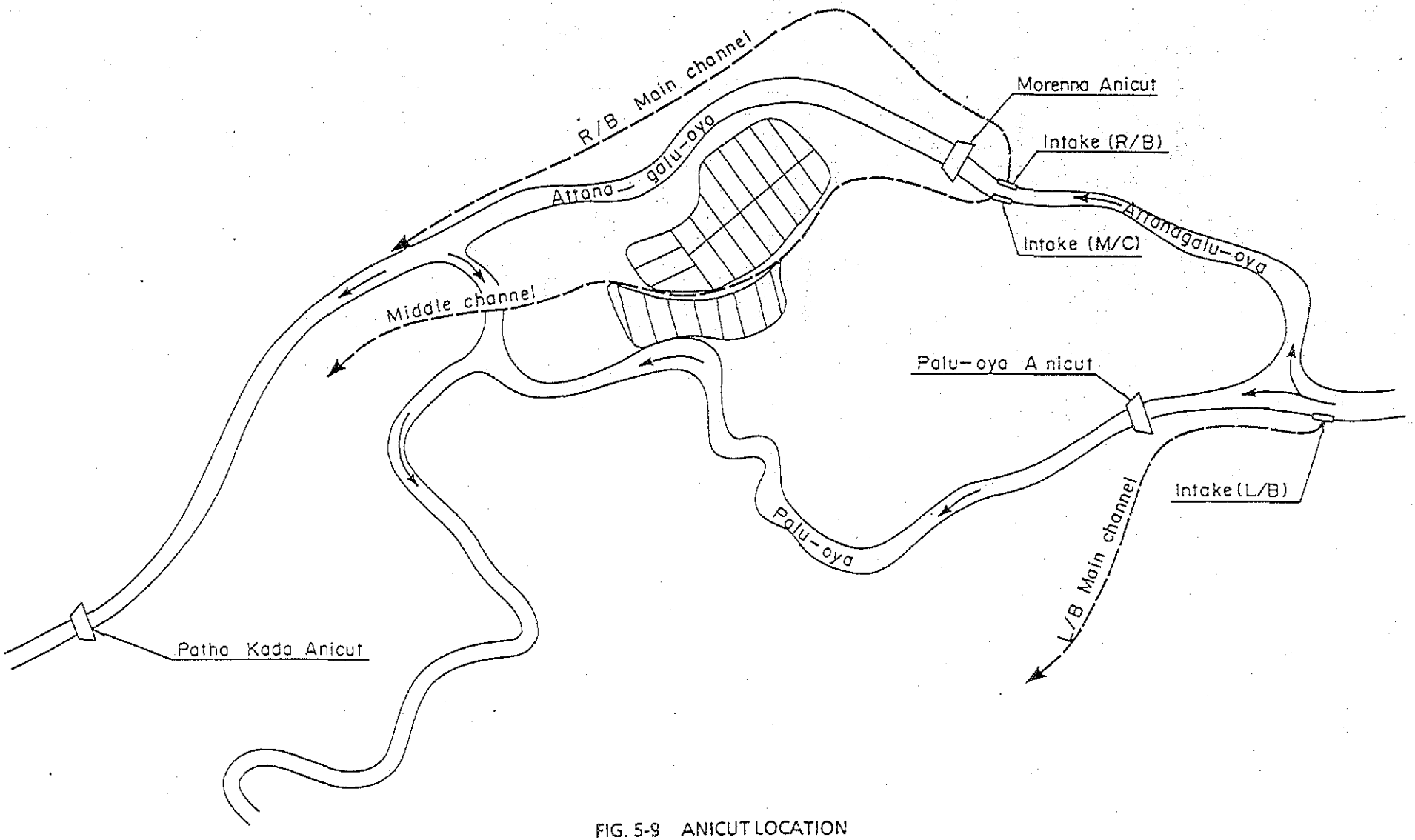


FIG. 5-9 ANICUT LOCATION

(ii) Canal Rehabilitation

(a) Orientation and Scope

Orientation for rehabilitation is to be as follows.

① Present canal route is to be preserved to the extent possible

② Canal structure is to be two kinds: concrete lined and earth. Brick lining will not be adopted. Pipe will not be adopted in consideration of O/M requirements.

③ Canal width will be reduced by lining, and O/M road constructed on the berm (B = 2.50M)

④ Scope of rehabilitation works is to include main, branch and secondary canals

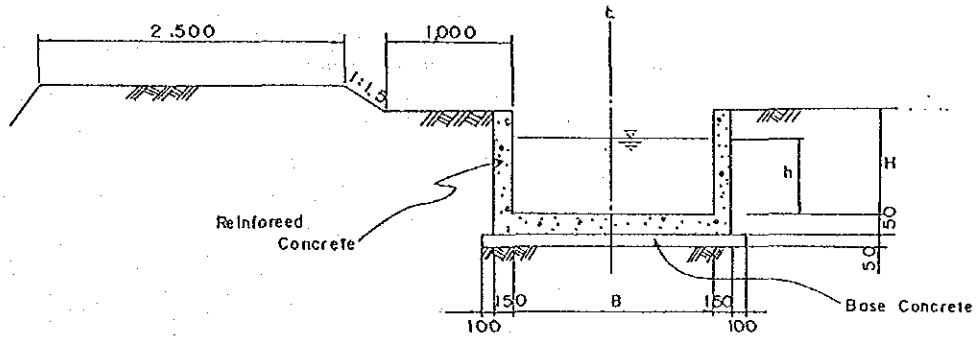
(b) Longitudinal Profile

Present canal gradient is 1/1000 - 1/6000. Paddy field elevation is 10.0-14.1m. Design elevation for field turnout is 30cm above field elevation.

Longitudinal profile for canal is further determined with consideration to drop structures, turnout locations and flow velocity.

TABLE 5-47 MAIN CANAL PROFILE

Canal	Gradient	Drop works	Canal cross-section
R/B main canal	S= 1/1,000 ~ 1/5,000	3	7 sections for RBI ~ VII
M/C main canal	S= 1/400 ~ 1/3000	—	4 sections for MCI ~ IV
L/B main canal	S= 1/1200 ~ 1/3000	3	4 sections for LBI ~ IV



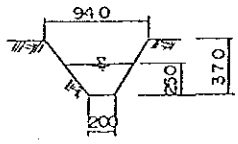
Channel	Section	B (mm)	h (mm)	H (mm)
RB - I	No 2+50.0 ~ No 5 + 13.0	1.500	78.0	950
II	No 5+13.0 ~ No 19+82.5	1.500	67 0	850
III	No 19 + 82.5 ~ No 18+ 17.5	1. 300	620	800
IV	No 18 + 17.5 ~ No 24	1. 200	560	650
V	No 24 ~ No 27	1. 000	480	650
VI	No 27 ~ No 31 + 50.0	700	320	450
VII	No 31 + 50.0 ~ No 37			
LB - I	No 0 ~ No 3 + 94.0	1,200	530	650
-II	No 3 + 94.0 ~ No 5 + 56.5	1,200	380	500
-III	No 5 + 56.5 ~ No 19 + 29.0	1.000	500	650
-IV	No 19+29.0 ~ No 31	800	300	500
MC - I	No 0 ~ No 0 + 60.0	7 00	330	450
-II	No 0+60.0 ~ No 1 + 60.0	φ762	Concrete Pipe	
-III	No 1 + 60.0 ~ No 5 + 89.0	500	280	400
-IV	No 5 + 89.0 ~ No 10 + 12.5	500	220	350

FIG. 5-6 TYPICAL CROSS SECTION OF MAIN CHANNELS

5-2-4 Facilities under Scheme for Improvement of Agricultural Support System

(1) Description of Facilities

TABLE 5-48 FACILITIES DESCRIPTION

Location	3 sites in district	8 sites in district
Work item	Fertilizer storehouse construction	Seed storehouse construction
Area	Land owned by Agrarian Services Dept.	Land owned by Agricultural Dept.
Facility description	6 structures (45 m^2/structure)	8 structures (45 m^2/structure)
Schedule	PHASE II	

(2) Building Facilities

11 Locations in Gampaha District (ASS Scheme)

TABLE 5-49 FACILITIES UNDER ASS SCHEME

No.	Buildings	Stories	Bld. Area (m2)	Fl. area (m2)	Structure	Wall	Roof
1	Store (14 units)	1	45.0	45.0	brick	brick	roof tile

No.	Place	Quantity	Remarks
1	Ja-Ela	1	fertilizer store
2	Marandagahamula	1	fertilizer store
3	Mirigama	1	fertilizer store
4	Mudungoda	1	fertilizer store
5	Delgoda	1	fertilizer store
6	Andiambalama	2	seed store, fertilizer store
7	Nittambuwa	1	seed store
8	Mabodala	1	seed store
9	Urapola	1	seed store
10	Udupila	1	seed store
11	Gampaha	2	seed store x 2
12	Bemmulla	1	seed store

5-2-5 Facilities under Scheme for Improvement of Agricultural Training System

(1) Description of Facilities

TABLE 5-50 FACILITIES DESCRIPTION

Location		Walpita		Ambepussa	
Work item		Improvement of training facilities	Rehabilitation of water supply facilities	Improvement of training facilities	Rehabilitation of water supply facilities
Site location		Inside training center compound	Training center and training farm	Inside training center compound	Inside Agr. Dept. seed farm compound
Facility description	Civil	———	· Well, pump, pipe construction · Storage tank, pipe construction (rehabilitation)	———	Well, pump, pipe construction (new construction)
	Building	Garage Workshop	Pump house (1)	Garage Workshop	Pump house (1)
Schedule		PHASE I		PHASE I	

(2) Civil Works

(i) Walpita DTC

(a) Present Area

Two wells shown in the following table are used as a water source at the center.

TABLE 5-51 WATER SOURCE

Water source	Pumpable discharge/ day	Calculation	Location
Shallow well Ⓐ	15 m^3	45 m^3/3 days (recoverable days)	400 m to east side of DTC center (inside Coconut Board)
Shallow well Ⓑ	37 m^3	112m^3/3 days (recoverable days)	400 m to south side of DTC center

Water is pumped up from the wells, conveyed to and stored in a storage tank (V=120m^3) within the field. From the storage tank, water is supplied to the farm and the facilities within the field through a pipeline. Water has been used as shown in the table below. Water irrigation has been less than 1 mm/day for 27,400m^2 of irrigated area and there has been a water shortage all through the year. As a result, it has been interfering with the implementation of the training at the center.

TABLE 5-52 CURRENT WATER REQUIREMENT

Item	Water Requirement	Remarks
Irrigation	23 m^3/day	5,000 gal/day (1 Gal = 0.00455 m^3)
Domestic	35 m^3/day	2,500 gal/day (11.4 m^3/day) : staff; 9 families: 30 persons
		5,000 gal/day (22.8 m^3/day) : Trainees: max. 80 persons
Livestock	2 m^3/day	Chicken : 60 ; Cattle : 10

(b) Design Water Requirement

The planned water requirement per day is shown in the following table.

TABLE 5-53 DESIGN DAILY WATER REQUIREMENT

Item	Required water quantity (m^3/day)	Calculation
Irrigation water	110	27.400 m^3 × 3 mm/day × 1/0.76 (Irrigated area) (Irrigation effic.) } Conveyance loss : 0.95 Irrigation loss: 0.80
Domestic water	42	Staff (9 families) : 30 persons × 380 ℓ/day/person (11.4 m^3/day ÷ 30 persons) Trainees : 105 persons × 285 ℓ/day/person (22.8 m^3/day ÷ 80 persons)
Livestock water	2	Domestic fowl : 1 ℓ/day × 60 , Cattle : 150 ℓ/day × 50
Washing water	2	Jeep : 350 ℓ/day × 1 Tractor, Sprayer : 100 ℓ/day × 12 Trailer, Motor cycle : 50 ℓ/day × 8
Total	156	

Irrigation water requirement is expected to be 3mm/day. Also domestic water for trainees to be increased by the subject plan must be assured. In addition washing water is newly planned.

(c) Facilities Plan

Facilities plan is as follows:

TABLE 5-54 DESIGN FACILITY COMPONENTS

Feature		Remarks
Water resource	Shallow well	V = 423 m^3, (14.0m × 8.0m × H=4.0m)
Intake	Pump	P = 4.85 kw
Water supply	Gas pipe	ϕ100mm, L = 280 m
Reservoir water	RC tank	V = 160 m^3
Drainage	PVC pipe	ϕ50 ~ 100 mm, L = 1,250 m
Irrigation	Sprinkler	Low pressure type: 4 sets, Irrigated area: 27,000m^2

(d) Water Source Plan

The shallow well Ⓑ is to be reconstructed and enlarged. Water for meeting the above design daily water requirement is to be obtained from the shallow well Ⓑ together with the current water source of the shallow well Ⓐ. According to the interview survey at the site, the shallow well Ⓑ recovers in three days during the dry season. Considering those factors, the scale of the plan was determined.

The planned scale of the shallow well Ⓑ
= (the design water requirement a day — the current water source of the shallow well Ⓐ) × 3 days
= (156m^3 — 15m^3) × 3 days (number of days for recovery)
= 423m^3

(e) Storage Tank Plan

Capacity of the planned storage tank is the design water requirement for one day considering a possible breakdown in the pumping system. It will be constructed on top of the existing storage tank.

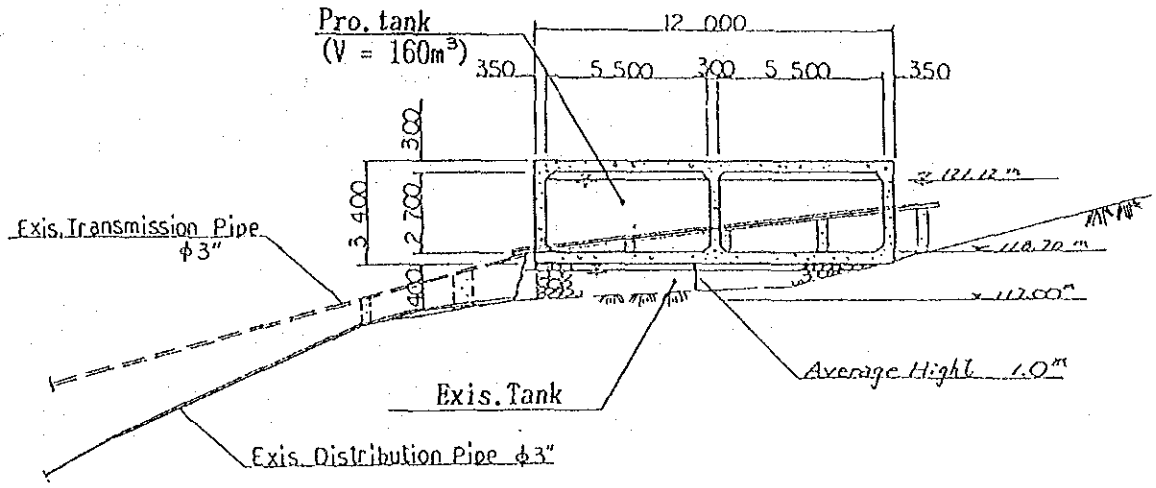


FIG. 5-7 DESIGN DISTRIBUTION TANK

(f) Pumping Plan

A pump is to be run 6 hours a day considering working hours of the staff in the center.

The planned features are as follows:

TABLE 5-55 PUMP PLAN

Feature		Remarks
Pump discharge	Q = 6.71 ℓ/s	(0.40 m³/min.), 145 m³/S × 1/(60 h × 60 m × 60 S)
Velocity inside water pipe	V = 0.76 m/s	φ100 mm, L = 280 m, C = 100, Hf = 15.05/1000 m (friction loss)
Head	H = 40 m	$15.05\text{m} \times \frac{280}{1000} + 35.12\text{ m}$ (Net head)
Motor output	P = 4.85 kw	$0.163 \times \overset{Q_2}{0.40} \times \overset{H_2}{40} \times 1.20/0.45$ (Pump efficiency)
Bore	φ75 mm	$146 \times \sqrt{\frac{0.40}{1.50}} = 75.4$

(g) Irrigation Method and Water Distribution Plan

Water flows by gravity from the storage tank and is sprayed through low pressure sprinklers. Pipeline system plan is as follows:

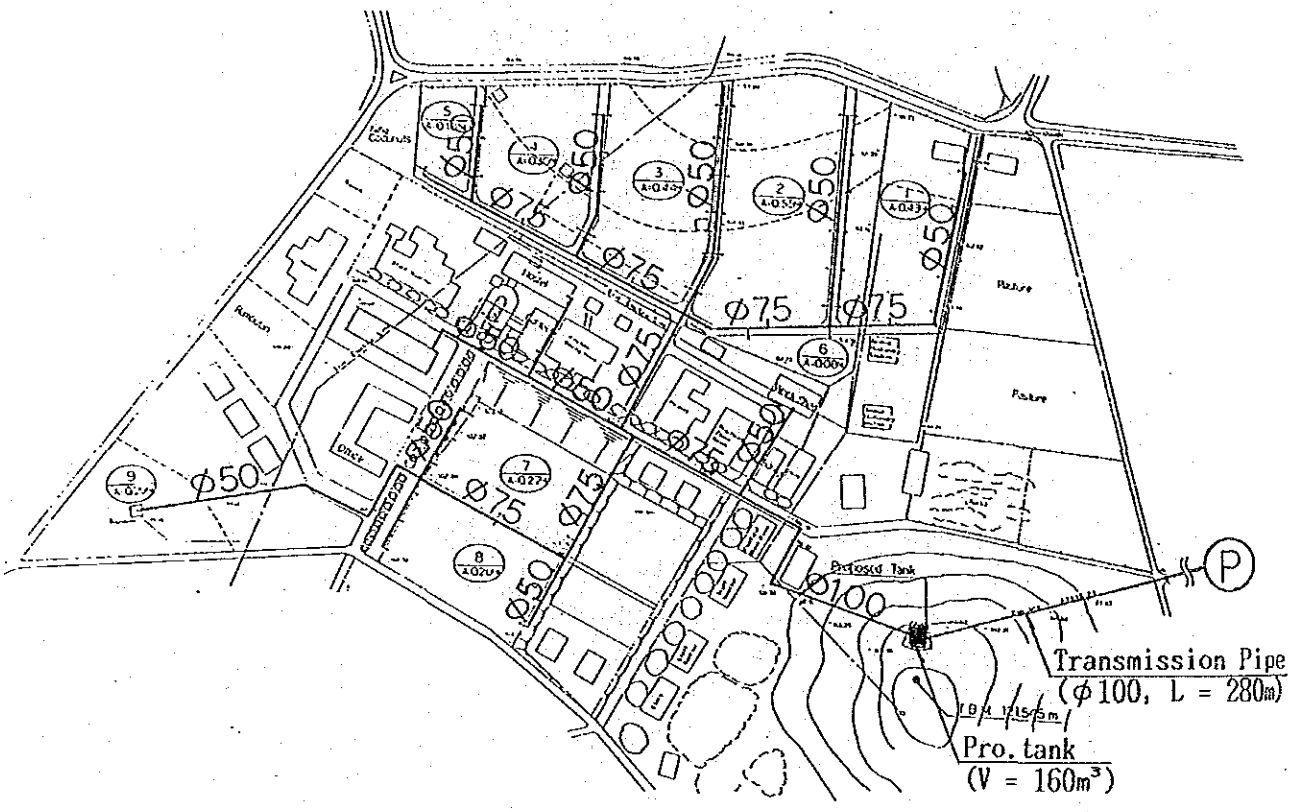


FIG. 5-8 WALPITA DTC

(3) Buildings

(i) Layout

(a) Walpita DTC Scheme Facilities

TABLE 5-56 DESIGN FACILITIES

	No. of Floors	Area	Floor Area	Construction	Exterior	Roof
Workshop	1	162.0	162.0	RC	brick	wood frame/slate
Garage	1	60.0	60.0	RC	brick fence	steel bar frame/ slate
Pumphouse	1	5.0	5.0	brick	brick	wood frame/brick

TABLE 5-57 WORKSHOP (162.0M²)

Floor	Room	Area	Ceiling	Remarks
1	workshop	139.5		repair of tractor, etc. and training
	office	10.5	3.0	management of machinery/equipment
	storehouse	9.0		
	toilet	3.0	2.5	

(b) Ambepussa DTC Scheme Facilities

TABLE 5-58 DESIGN FACILITIES

	No. of Floors	Area	Floor Area	Construction	Exterior	Roof
Workshop	1	162.0	162.0	RC	brick	wood frame/slate
Garage	1	60.0	60.0	RC	brick fence	steel bar frame/ slate
Pumphouse	1	5.0	5.0	brick	brick	wood frame/brick

5-3 Equipment Plan

Technical levels, frequency of use, difficulty of operation and maintenance, availability of spare parts and expendables and costs bearable on the Sri Lankan side were taken into consideration in determining machinery.

5-3-1 Agricultural Technology Transfer Scheme

(1) Farm Machinery

Model farms are divided into two: one mainly for paddy in Morenna and the other for upland crops at Ambepussa.

(i) Morenna

① One 4-wheeled tractor, 40hp, together with attachments including a 3-t trailer, a rotary harrow, disc plow, iron wheels, etc.

② One 2-wheeled tractor, 12.5hp, with 0.5 ton trailer, rotary ridger, etc.

③ Three paddy field plows, to be not only used in the model farm but also rented to the Morenna model irrigation area for exhibiting the effects of cultivation for the transfer of techniques.

④ Three thresher-harvesters, to be rented to the Morenna model irrigation area for demonstration

⑤ Two each of automatic and manual sprayers, backpack type, to be allocated to the Aluthgama Bogamuw Agrarian Services Center to which the Morenna model irrigation area belongs for renting to farmers.

⑥ Drying machines (medium size), platform scales, wheel barrows, and tools

(ii) Ambepussa

① One 4-wheeled tractor, 40hp, with 3 ton trailer, a rotary harrow, disc harrow, disc plow, ridger, etc., for use in upland fields.

② One 2-wheeled tractor, 12.5hp, with 0.5 ton trailer, rotary ridger, etc.

③ Automatic and manual sprayers (2 each), platform scales, wheel barrows, hoes, shovels, forks, rakes, soil testing kits, cold gauze, etc.

(2) Extension Activity and Office Equipment

At the ATT Center, lecture rooms will be constructed and the following equipment will be provided.

Slide projector (1)

Overhead projector (1)

TV set and video deck, 20" color, PAL mode (1)

Voltage regulator (2)

The following office equipment will also be provided.

Copy machine

Typewriters (English and Singhalese), white and black boards, exhibition cases for crops, etc.

(3) Soil Testing Equipment

The following soil testing equipment is to be provided.

Soil testing kit (scoop for soil sampling, folding rules, etc.

Soil auger (soil sampling to 1.0m)

Soil nutrient analyser

pH meter

Soil sacks, scales, reverse percolation water purifiers, beakers, flasks, cylinders, etc.

(4) Tool Kits for Workshop

Considering frequency of equipment use, only tools for daily maintenance will be provided. This will include vices, drills, grinders, bolt cutters, etc.

(5) Vehicles

The following vehicles will be provided for operations of the Center director and 7 staff (technical and administrative)

Jeeps (4, one of which is for Ambepussa)

Motorbikes (3, one of which is for Ambepussa)

5-3-2 Minor Export Crop Promotion Scheme

The MEC farm will be established at Walpita. The district office is at Gampaha City.

(1) Office Equipment

Typewriters (in English and Singhalese), desktop calculators, exhibition glass cases for crops, and an O/H projector will be provided.

At the district office, a copying machine, typewriters (in English and Singhalese), desktop calculators, etc., will be provided.

(2) Farm Machinery

The following agro-machines will be provided

One 4-wheeled tractor, 40hp, with trailer

One 2-wheeled tractor, 12.5hp, with trailer

Sprayers (2 each of automatic and manual), backpack type

(3) Vehicles

The following vehicles are to be provided to the MEC farm for staff transportation and delivery of materials and seedlings.

(i) District Office

Jeep (1)

Motorbike (1)

(ii) MEC Farm

Pick up van, 4WD (1)

3.5t truck (2)

Motorbike (2)

5-3-3 Morenna Model Irrigation Scheme

One jeep and two motorbikes are to be provided for water management, and one 2-wheeled tractor with trailer for transport of machinery and materials for maintenance. Vehicles will be under the supervision of the Irrigation Department Gampaha office.

5-3-4 Scheme for Improvement of Agricultural Support System

Concerned agencies under the scheme are the Department of Agrarian Services (DAS), Extension Section of the Department of Agriculture (DA), and the Agricultural Development Authority (ADA). Under the scheme, equipment and materials will be provided to these agencies to strengthen their farmer support activities. One of the biggest roles played by DAS and DA Extension is the delivery of production materials to farmers.

Production materials comprise seeds (mainly paddy) and fertilizers. Two 5t trucks necessary for transporting the production materials from the central storehouse to 26 ASC's, and 52 2-wheeled tractors (2 per ASC) for delivery from ASC's to each farmhouse. One truck is to be deployed each to DAS and DA district offices, and one tractor each to each ASC. Both agencies will require independent transportation due to the concentrated need to deliver materials in the planting seasons occurring twice yearly.

The Sri Lankan side has requested 61 motorbikes for use by extension workers. However, it is considered sufficient to provide 13 each to the DAS and DA in light of the motorbikes already in use.

The Agricultural Development Authority is the agency which supervises and monitors implementation of farmer support services, making sure that benefits are extended equally to all farmers. Accordingly, one jeep and 5 pickups will be provided to the ADA district office to strengthen its activities, which will have a great impact on the success of the Project. Pickup vans are chosen because their beds are useful for transportation of the production materials which the ADA district office must perform from time to time.

5-3-5 Scheme for Improvement of Agricultural Training System

There are two DTC's in Gampaha District, one at Ambepussa and one at Walpita. Supply of equipment and materials focuses on supplementing existing old facilities, although it includes as well items for the new agricultural training envisaged under the Project.

(1) Farm Machinery

The following are to be provided.

One 4-wheeled tractor, 40hp

One 2-wheeled tractor, 12.5hp, with trailer, disc harrow, plow, scraper, etc.

Sprayers

4-wheeled tractors and 2-wheeled tractors are to be provided at Ambepussa (2 each) and at Walpita (1 each).

(2) Horticulture Equipment

Scissors, sample bottles, lawn mowers, ladders, brush-cutters, pocket lenses, etc., are to be provided to Ambepussa and Walpita for horticultural training.

(3) Carpentry Tools

Power plane, power saw, vice, hammer, hand saw, drill and other tools are to be provided to Ambepussa.

(4) Teaching Equipment

O/H projector, slides, TV and video set, white and black boards and a copy machine are to be provided to both Ambepussa and Walpita.

(5) Seed Preservation Equipment

Refrigerators (270ℓ) are to be provided one each for Ambepussa and Walpita.

(6) Workshop Tools

Tools for daily maintenance of agro-machinery and for some simple machining of spare parts (one set each) are to be provided to Ambepussa and Walpita.

(7) Vehicles

One jeep and two motorbikes each are to be provided to both Ambepussa and Walpita.

(8) Lab Equipment

Lab equipment including sample bottles, microscope, soil testing kits, desiccator, moisture meter, rain gauge, beakers, and scales are to be provided to Walpita.

(9) Home Economics Equipment

Sewing machines, electric ovens, mixers and others are to be provided to Walpita.

5-3-6 Project Office

The Project Office is the implementing entity of the IRDP, and will coordinate the activities of the concerned agencies. For extension activities, two minibuses (26 passenger), and 1 AV car are to be provided, and are envisaged for communal use by related agencies under the Project in its initial phase. The AV car will be equipped with 16mm projector, slides, O/H projector, and TV set for mobile extension of cropping technology throughout the District.

Office equipment will include typewriters (English and Singhalese), a copy machine and two staff jeeps.