CHAPTER 2

CHAPTER 2 BACKGROUND

2.1 Agricultural Sector

2.1.1 National Economy and Agriculture

(1) Economic Development Plan

Although Sri Lanka enjoys a relatively high per capita GNP (US$ 566) among Asian countries, and exhibits healthy social indicators including life expectancy (71 years), literacy rate (89%), primary school enrollment rate (90%), etc., prolonged ethnic conflict in the Northern and Eastern provinces has actualized expansion of fiscal deficits, deterioration of international balance of payments, high unemployment rate, acceleration of inflation and economic stagnation.

In order to address this economic crisis, the Sri Lankan Government in collaboration with the World Bank and IMF drew up a Policy Framework Paper comprising target macro-economic indicators and a proposed structural adjustment program to achieve the same, and restructuring of the economic industrial structure in line with the program is now being pursued. These measures are aimed at achieving the principal policy targets of stability of the macro-economy, rationalization of the public sector, promotion of private sector activities and alleviation of poverty. Reinforcement of measures to alleviate poverty is accorded particularly high priority in order to minimize any social inequities occurring in the course of implementing the structural adjustment program. Essential features of the structural adjustment program with regards to the agricultural sector include: ① elimination of subsidies for production of rice and milled wheat, ② privatization of agro-related public firms, ③ lowering of tariff rates for agricultural produce, and ④ promotion of private sector participation in the distribution market for rice, fertilizer and milled wheat. In addition to the agricultural sector, the said program targets financial, transport and telecommunications sectors as well, and future economic growth performance is expected to hinge on the success or failure of the Sectoral Reform Policy formulated in collaboration with the World Bank and IMF.

At present, in place of a formulated a long-term, comprehensive economic development plan, the Sri Lankan government yearly modifies the existing Five-year Public Investment Plan on a rolling plan basis. Under the current said plan (1995~1999), the major targets under economic development are accelerated economic growth, and equitable distributions of the benefits of economic growth. Support is to be continued for the existing structural adjustment program and strengthening of efforts towards reduction of fiscal deficit, promotion of economic infrastructure projects, and privatization of public firms. Also, in order to improve the quality of life over the long term, budget allocations are to be expanded for social services, education, medical services, health and sanitation and social welfare and private sector participation encouraged through market friendly policy to give impetus to the government's program to strengthen and invigorate the nation's economy.

(2) Macro Economic Indicators

Macro economic indicators under the structural adjustment plan in collaboration with the World Bank · IMF are indicated in Table 2.2.1-1.

Table 2.2.1-1 Macro Economic Indicators

Indicator	1988	1989	1990	1991	1992	1993	1994
Real GDP growth rate (%)							
Target	5.5	2.0	3.0	5.0	5.3	5.5	6.0
Achieved	2.7	2.3	6.2	4.6	4.3	6.9	5.5
Consumer price increase (%)							
Target	7.5	12.0	10.0	13.6	9.4	7.5	6.5
Achieved	14.0	11.6	21.5	12.2	11.4	11.7	8.4
Government deficit (% of GDP)							
Target	11.0	12.5	10.4	10.1	8.8	8.0	7.1
Achieved	15.7	11.2	9.9	11.6	7.3	8.1	10.0
Expenditure (% of GDP)							
Target	--	33.8	31.8	29.5	28.2	27.6	27.2
Achieved	34.5	32.6	31.1	32.1	27.5	27.9	n.a.
Current deficit (% of GDP)							
Target	8.2	10.8	8.4	5.8	5.9	5.8	5.7
Achieved	8.5	7.1	5.5	9.5	5.4	6.5	n.a

Source: Annual Reports, Central Bank of Sri Lanka

Although economic growth rates for 1991 and 1992 were low, a growth rate in 1993 of 6.9 % was achieved which was well above the target for that year. For the past 3 years (1991~1993), inflation has been at around 12%, showing a suppressed trend . Proportion of fiscal deficit to real GDP showed some recovery through 1993 due to Government efforts to reduce expenditure; however, this situation worsened in 1994 with the said rate being at 10% reflecting revival of subsidies for fertilizer.

The present administration emphasizes the strengthening of the role of the private sector in the economy and has formulated policy to accelerate economic growth through ① creation of a saving surplus to be targeted for investment in the private sector by greatly reducing the Government's fiscal deficit, and ② lowering of interest rates through reduction of the inflation rate to induce investment. Major target economic indicators by the year 1999 include: ① economic growth rate of 6.9% (per capita income increase of 5.7%), ② inflation rate under 6.0%, ③ fiscal deficit at 5.1% of real GDP, ④ private investment at 27% of real GDP, ⑤ savings rate of 22% of real GDP, and ⑥ current deficit of 4.9% of real GDP.

(3) Agriculture

The agricultural sector is a mainstay of the nations economy and accounts for 20.9% of GDP (1993), 22.9% of exports, and 38.5% of employed labor. Growth in the sector shows increase of 4.9% over the previous year due to factors of good weather, increased use of chemical fertilizers, and rise in guaranteed prices for farm products. Also, contribution to this growth in the sector by increased paddy production is significant, showing a said increment over 9.9% (2.57 million tons) over the previous year, achieving the highest production level in the past 6 years. Imported rice and fertilizer account for 1.2% (down 16.3% over the previous year) and 1.6% (up 31.4% over the previous year), respectively, of total import value reflecting the good domestic harvest and return of fertilizer consumption to the level prior to abolishment of subsidies in 1990.

The role of agriculture in the domestic economy is summarized by sector wise comparison of contribution to the GDP in Table 2.2.1-2.

Table 2.2.1-2 Sector-wise Contribution (%) to GDP

Sector	1989	1990	1991	1992	1993	1994 (estimated)
Agriculture, forestry, fishery (%)	22.7	23.2	22.6	21.3	20.9	20.6
Plantation	5.4	5.4	4.9	4.2	4.3	4.6
Paddy	4.3	4.9	4.4	4.2	4.3	4.2
Others	13.0	12.9	13.3	12.9	12.3	11.8
Industry (%)	26.8	27.2	27.0	27.8	28.5	28.9
Mining	3.0	3.0	2.6	2.4	2.5	2.4
Manufacturing	16.8	17.4	17.7	18.5	19.1	19.7
Construction	7.0	6.8	6.7	6.9	6.9	6.8
Service (%)	50.5	49.6	50.4	50.9	50.6	50.5
Power, water, gas utilities	1.2	1.3	1.3	1.4	1.4	1.4
Transport · telecommunications	32.4	31.6	32.6	33.1	33.1	33.2
Financial	5.1	5.1	5.1	5.1	5.3	5.5
Others	11.8	11.6	11.4	11.3	10.8	10.4
Total GDP in 1982 prices (Rs 0.1 billion)	1,217.3	1,292.4	1,352.0	1,409.9	1,507.8	1,591.2

Source: Public Investment 1995~1999, Department of National Planning

Contributions to the national GDP (1989) were at levels of 22.7% for agriculture, forestry and fishery, 26.8% for industry and 50.5% for services. In 1994, the same are estimated respectively to be 20.6%, 28.9% and 50.5% indicating a downward trend in the agricultural sector. In contrast, growth in the industrial sector has increased yearly over the same period reflecting a shift from industrialization through promotion of domestic industries to counter imports, to the promotion of export oriented industries.

Within the agricultural sector, production of rice has leveled off, while production of the 3 main plantation crops of tea, rubber and coconut, as well as livestock, forest and fishery products have show significant decrease. Employed labor in the agricultural sector has dropped from 47.5% in 1990 to 38.5% in 1993.

Government budget outlays in the agricultural sector are indicated in Table 2.2.1-3.

Table 2.2.1-3 Budget Outlays in the Agricultural Sector

Item	1989	1990	1991	1992	1993
Mahaweli development program (%)	40.5	26.6	35.3	36.9	36.2
Other irrigation development (%)	10.7	12.6	13.9	12.3	13.6
Forestry (%)	5.5	5.6	5.4	11.4	19.5
Crop cultivation (%)	8.0	8.8	8.0	11.3	11.4
Animal husbandry (%)	1.3	1.5	2.6	0.3	0.4
Fishery (%)	3.5	2.0	2.1	3.5	5.3
Plantation (%)	9.0	18.9	20.6	10.1	6.4
Others (%)	21.5	24.0	12.1	14.2	7.2
Total government investment in agricultural sector (Rs 0.1 billion)	69.3	66.1	76.4	72.5	72.1
Total government investment (Rs 0.1 billion)	382.2	408.1	423.9	437.4	468.8
% of national budget allocated to agricultural sector	18.1	16.2	18.0	16.6	15.4

Source: Public Investment 1995~1999, Department of National Planning

Government investment budget in the agricultural sector over the 5 year period 1989~1993 has been around 17%, with an 80% execution rate. This budget has been targeted primarily at the construction and rehabilitation of irrigation facilities, replanting of plantation crops, and agricultural financial services. Budget allocation to irrigation development projects has been 49.8% of the total allocation to the agricultural sector. This is followed in terms of proportion by allocations to forestry (19.5%) and cultivated cropping (11.4%). Item-wise, investment in irrigation projects has leveled off at 50%, while that targeted at cultivated cropping, forestry and fishery has shown increase. On the other hand, allocation to animal husbandry and plantation crop production has evidenced significant decrease.

2.1.2 Agricultural Policy

The strategic importance of agricultural policy until the mid 1980s was the implementation of new irrigation development schemes such as the Mahaweli Development Programme in order to achieve self-sufficiency in domestic rice production. Construction of irrigation facilities under these schemes expanded cropped area and improved land productivity, resulting in a dramatic increase in rice production. In order to diffuse population pressure on major urban areas, settlement in the Dry Zone was encouraged under the Mahaweli Development Programme. The objectives of this resettlement were both to contribute to increase in rice production and to reduce unemployment. Self-sufficiency rate in rice production peaked in the mid 1980's at almost 100%, after which it went into a declining trend with corresponding decrease in rice production. To address this, efforts were made to increase rice production and promote the introduction of crops with high value added.

It is generally agreed that the weakness in the past agricultural policy was an over-emphasis on industrial protection policy at the expense of the agricultural sector. To rectify this, new agricultural development strategy accords a high priority to loosening of the various government controls and regulations affecting the agricultural sector to encourage independent spirit and creative energy among farmers, and promote a shift from monoculture to a more diverse, export-oriented agricultural structure.

Agricultural development goals under the Public Investment Plan (1995~99) are as follows:

(1) Transform the traditional farming sector to one which raises farm productivity and provides a higher income for those engaged in it

(2) Improve processing and marketing (agro-industries) and develop downstream activities to increase value addition, particularly of non-traditional crops

(3) Create an exportable surplus of agricultural products, thereby diversifying the economy and strengthening the balance of payments

(4) Increase the productivity of the plantation crop sector

(5) Provide greater employment opportunities in rural regions, thereby reducing the population pressure on urban areas

(6) Stabilize and significantly reduce the cost of living of the population as a whole and provide an adequate diet at affordable price to the poor

The strategy and policy framework to achieve the above goals are as follows:

(1) Elimination of the hidden discrimination against agriculture flowing from the inequitable macro-economic and trade policies of the past

(2) Elimination of all monopolies in agricultural markets while fostering greater competition

(3) Reorganization of the agricultural research system to make it more responsive to the needs of producers and the market

(4) Strengthening of agricultural support service, especially in extension

(5) While improving the management of land and water (including underground water resources, forestry and other resources), the existing irrigation and other agricultural infrastructure facilities (roads, rural electricity, telecommunications, etc.) will be rehabilitated. A coordinated plan to develop the use of surface, ground and run-off water will be implemented with due regard to environmental considerations.

(6) Removal of the restraints on the leasing of land in agricultural settlement schemes and taking steps to grant freehold title to settlers

(7) Ensuring the adequacy of producer incentives and marketing infrastructure for agricultural commodities

(8) improvement of the efficiency of state owned plantations by bringing in private sector capital in equity and management

(9) The development assistance schemes will continue for the rehabilitation of plantation crops but rationalized. Technical programs will be formulated to maximize the income of farmers through an integrated farming system of inter-cropping, animal husbandry and other related activities.

(10) Off-shore fishing will be encouraged through development assistance and support services will be given t the private sector to develop inland fishing

(11) Reorganization and restructuring of the existing farmer organizations on the basis of co-operatives or public companies

(12) Delivery of rural credit facilities will be revived through appropriate rural financial institutions to provide short and long term loans for agriculture, livestock and fisheries development.

2.2 Irrigation Sector

Against the background of a shift in agricultural policy from monoculture farming to an export oriented agricultural structure, the fact that development of new farm land has essentially approached its critical limit, and the fact that there are severe constraints on government capacity to make outlays for construction of new irrigation facilities which require a large initial investment, there has been a likewise shift away from the construction of new irrigation facilities to facility rehabilitation in order to upgrade the irrigation efficiency of obsolete irrigation facilities and increase the

productivity and cropping intensity of existing cultivated land. Under this new approach, institutional and organizational aspects affecting irrigation system operation were given priority in addition to facility rehabilitation per se, and the importance was recognized of appropriate operation and maintenance of the said facilities which maximizes farmer participation. Furthermore, this approach is anticipated to prove to be of higher economic profitability than investment in new irrigation facilities.

With the above described shift in policy, various rehabilitation programs including the Major Irrigation Rehabilitation Project have been initiated on a nation-wide basis aimed at upgrading agricultural production and income, and generally enhancing the living standards of beneficiary farmers through the rehabilitation of existing irrigation facilities and introducing appropriate operation and maintenance of the facilities by farmer organizations.

In the afore described manner, recent irrigation development strategy aims at maximum efficiency of water use through the rehabilitation of existing systems and transfer of responsible for O&M to the beneficiary farmers. In order to reduce the government role in this type of development, the active participation of the farmer at the project planning and operational level are encouraged with maximum focus on practical and sustainable projects. In the selection of candidate rehabilitation projects, the level of farmer organization becomes a key factor, with farmer groups being required to bear a portion of the labor costs for rehabilitation works and to assume responsibility for operation and maintenance upon completion of construction.

In the case of minor schemes, the entire responsibility for O&M is transferred to the FOs. Under large scale schemes, the practice to date has been to shift responsibility in this regard for D-canal facilities and below to the farmers. In the future, it is planned that the official role in the management of systems will be reduced to advice on technical and institutional matters, and O&M of anicut facilities in the case of major irrigation schemes. One result of this irrigation development strategy can be seen in the implementation of minor schemes under which jurisdiction which originally lay with the Department of Agrarian Services has been devolved to the Provincial Councils.

In the past 5 years, completed irrigation projects have included the Kirindi Oya Irrigation and Settlement Project, the Major Irrigation Rehabilitation Project, the Irrigation Systems Management Project, and the Village Irrigation Rehabilitation Project. Also, there are the INMAS (Integrated Management of Settlements) Program with emphasis on institutional aspects, and the IMPSA (Irrigation Management Policy Support Activity) program with focus on irrigation management policy aspects. With regards to institutional reorganization, the Agrarian Services Act was revised in 1990, under which the establishment and registration of farmer organizations was made mandatory. The Irrigation Ordinance was likewise amended, such that the Project Management Committees responsible for the collection of water use tariffs from beneficiary farmers and the operation and maintenance of large scale schemes where legally empowered to carry out their duties. In order to achieve the promotion of increased farmer organization, restructuring of irrigation related agencies and the encouragement of participatory system management under policy reform, a revision of

the law and regulatory system and establishment of a National Water Resources Policy Planning Body have been recommended.

Irrigation projects currently under implementation are described below.

(1) North Western Province Special Tank Rehabilitation Project

This project is being carried out under ECC funding and aims at the rehabilitation of 9 tanks in the province. Six locations (1,000 ac) have been completed as of 1993.

(2) North Western Province Water Resources Development Project

The project comprises components of strengthening rural infrastructure, rural financing and support to FOs. Under strengthening of rural infrastructure, ① 9 medium scale irrigation schemes and 300 minor irrigation schemes are to be rehabilitated, ② 5 major irrigation schemes, 17 medium scale irrigation schemes and 300 minor irrigation schemes are to be improved, ③ 1 medium scale irrigation scheme and 30 minor irrigation are to be restored, ④ extension programs are to be carried out for 4 areas, and ⑤ 740 km of road are to be rehabilitated.

(3) National Irrigation Rehabilitation Project

This project aims at the rehabilitation of around 1,000 minor irrigation schemes and 60 major to medium scale irrigation schemes with a total benefit area of 37,500 ha. The establishment of FOs and the transfer of O&M responsibilities to the same are also planned. Since its commencement in 1992, rehabilitation has been completed in 30 minor schemes and 4 major schemes. Surveys and investigations have been completed in another 157 minor schemes and 35 major schemes.

(4) Minipe / Nagadeepa Irrigation Rehabilitation Project

This project has as its components rehabilitation and improvement of irrigation canals and related structures and the network of roads, rehabilitation of Nagadeepa reservoir and Minipe Irrigation Project and its drainage canals, and the support services.

2.3 Environmental Sector

The largest environmental pressure component in Sri Lanka is population increase. Population in 1871 of 2.4 million expanded to 8 million by the census of 1951, and then to 16.99 million by 1990. This sharp population increase has been accompanied by equally rapid destruction of forest cover. In1880, 84% of the nation's surface area was covered with forest. By 1956 this had declined to 44%, and then to 24% by 1989. Also, destruction of mangrove forest, and coral reef at the coast has increasing serious impact on the eco-system. Soil erosion, and runoff of agro-chemical and chemical fertilizer residue as a result of plantation agricultural in the central upland area has potentially serious consequences for lower basin areas.

Population in rural area is 80 percent of the national total, with 38.5% comprising the population directly engaged in agriculture. This excessive pressure on available land in rural areas, in addition to land ownership system constraints, has promoted increased practice of chena (slash and burn) causing widespread damage to forests and water resources. With recognition of the urgency for measures to protect the environment, various environmental procedures and legislation came into being. Under the National Environmental Act. No. 47 of 1980, the Central Environmental Authority (CEA) was created. The agency has established procedures and guidelines to be adhered to in the course of pursuing development projects.

The basis of present government policy with regards to the environment is the National Environmental Action Plan, 1992~96 announced by the Ministry of Environment and Parliament Affairs in October 1991. The plan aims at the preservation of the natural environment and provides a comprehensive range of proposals including a major focus on soil erosion caused by forest cutting as the major environmental issue facing the nation.

Also, the plan cites the importance of irrigation system rehabilitation, improvement of water management, and review of the land ownership system as crucial to establishing sustainable agricultural development. At the same time, the plan indicates the need for concern about the impact to the surrounding environment from the use of agro-chemicals and fertilizers.

The District Environmental Agency (DEA) is the central organization in Hambantota district in study environmental impact mitigation measures within its sphere of jurisdiction which includes the areas of the 3 schemes. Of particular concern in the case of all the schemes under the Project are:

- Appropriate use of agro-chemicals and chemical fertilizer to prevent adverse impacts in lower basin areas

- Through improved management of irrigation systems, the prevention of inundation and still water bodies which foster water borne or originating diseases including malaria, etc.

2.4 Administrative Organizations and Legal and Regulatory System

2.4.1 Management of Major Irrigation Schemes

Related agencies and main services provided to achieve the production goals under the major and medium irrigation schemes are as follows:

Agency	Service	Responsible agenc
Irrigation Department (ID)	Development, O&M of irrigation and drainage systems	MIP&E
Irrigation Management Division (IMD)	Irrigation system management	MIP&E
Agrarian Services Department (ASD)	Seed and fertilizer procurement support	MLA&F
Agricultural Department (AD)	Extension activities	MLA&F
Paddy Marketing Board (PMB)	Paddy purchase	MLA&F
Banks	Credit extension	--

In addition to agency jurisdictions determined by scheme size, it is also stipulated that diversion schemes which span 2 or more provinces be under the jurisdiction of the Ministry of Irrigation, Power and Energy (MIPE) and that diversion schemes contained within a single province be under the jurisdiction of the Provincial Council (13th amendment to the Constitution)

2.4.2 Government Agencies Related to Irrigation and Water Management

(1) Irrigation Department

The Irrigation Department is responsible for facility O&M, improvement and water management under major and medium schemes. A Senior Deputy Director, ranked directly under the Director General of the Department at the main headquarters oversees the responsibilities in this regard.

At the regional level, and ID Range Office is in charge. Scope of jurisdiction generally covers the entire district, and in some cases may include 2 districts. The duties of the Range Office Deputy Director are as follows:

1) To coordinate with related officials and personnel at the district level, and comprehensively manage and supervise the activities assigned to the office within its designated area of jurisdiction.

2) To effective operate and maintain schemes within the office's jurisdiction to a level that appropriate water management is realized.

3) To consult with concerned officials and personnel at the regional level in the preparation of yearly implementation plans and budget for scheme O&M.

4) To implement the above planning, with support in addressing engineering issues provided by the chief engineer, and support with financial and administrative matters provided by the accounting and general affairs sections of the office.

In-situ operations for each scheme area are the responsibility of the mid-level Irrigation Engineer in charge of the Divisional Irrigation Office whose duties are:

1) To manage and supervise the assigned activities of the office

2) To manage and maintain schemes within the offices jurisdiction to a level where appropriate water management is realized

3) To directly implement in the field the annually approved ID program

(2) Irrigation Management Division (IMD)

The IMD maintains a multidisciplinary staff who engage in integrated socio-economic planning for rural society in major and medium scheme areas. Duties of the department are:

1) To implement the INMAS program

2) To apply for and allocate budget for irrigation system O&M, system improvement and facility rehabilitation (partially in INMAS projects)

3) To organize FOs focused on irrigation management in scheme areas (only under INMAS)

4) To monitor irrigation and agricultural activities (only under INMAS)

The IMD has no regional organization outside of the INMAS program, however, it carries out its responsibilities where necessary via the relevant agency with a regional set up.

2.4.3 Executing Agencies for Agricultural Support Services

(1) Agriculture Extension and Research Agencies

The Department of Agriculture (DOA) and the Department of Agrarian Services (DAS) are the agencies engaged in agricultural extension activities. With regards to agricultural research, there are a Rice Research Station (Ambalantota) and regional agricultural research center (Angunakolapelessa) within the Project area. There are also 3 government seed farms for paddy and OFCs in the area.

In addition, the Coconut Cultivation Board, Export Agricultural Department and the Department of Animal Production and Health provide agricultural support services.

1) Department of Agriculture

Responsibility for agriculture extension fall under the jurisdiction of the Hambantota District Agricultural Extension Office (AD Office) under the Provincial Director of Agriculture in the case of the general area as a whole (in the case of this Project, the

Muruthawela scheme, and under the jurisdiction of the Inter-provincial AD (Assistant Director) directly under the DOA in the case of special development areas (in the case of this Project, the (Liyangastota and Badagiriya schemes).

Under the extension system, Agricultural Officers (AO) and Subject Matter Officers (SMO) responsible for various specific disciplines (paddy, OFCs, pest prevention, women in agriculture, etc.) are assigned to the extension office where they manage the activities of the Agricultural Instructors (AI) at the field level. There are 32 AI assigned to the AD Office and 9 AI under the Inter-provincial AD. There are a total of 21 AIs responsible for the Project area. These AI are normally attached to the Agrarian Services Center (ASC) office under the jurisdiction of DAS. Liaison with the AO is maintained via AI meetings 1~2 times a month.

In accordance with the Integrated Agricultural Extension Strategy (IAES), agricultural extension activities are pursued in team meetings at 3 levels wherein issues such as superior seed extension, the Integrated Pest Management program and labor shortages are addressed.

Information on extension activities are conveyed via monthly progress reports. The overall headquarters for extension activities is at the DAS main office in Colombo where counseling from the World Bank is also available. These activities comprise the Second Agricultural Extension Programme under IAES, which was commenced in February 1995.

2) Department of Agrarian Services (DAS)

Under the Assistant Commissioner at the DAS Hambantota district office, there are 3 officials (Deputy Assistant Commissioner, Divisional Commissioner and Headquarter Divisional Officer) who supervise the activities of the 16 Divisional Officers (DO) at the 16 Agrarian Services Centres (ASC) in the district. The 3 scheme areas under the Project area covered by 11 ASC organized as indicated in the table below.

Scheme		ASC	AIs assigned
Liyangastota	Walawe LB	Ambalantota area	2 persons (inter-
	Walawe RB	Lunama area	1 person (inter-provincial
Muruthawela	LB Main	Meegas Ara area	2 persons (provincial)
Reservoir	Tract-I	Weeraketiya, Udayara areas	3 persons (provincial)
	Tract-II	Angunakolapelessa area	1 persons (provincial)
	Tract-III	Wiraketiya, Udayala	4 persons (provincial)
	Urubokka Oya	Netorlopitiya, Beliatta, Udalayana areas	4 persons (provincial)
	Kirama Oya	Walasmulla area	7 persons (provincial)
Badagiriya		Badagiriya area	1 person (inter-provincial

Under the Agrarian Services Act, the DO have jurisdiction over the FOs and manage problems pertaining to farm land holdings and tenant contracts, as well as supply agricultural inputs (seed, fertilizer, agro-chemicals, etc.) to the FOs.

The DAS is responsible for the execution of the new AMA program directed by the central government and aimed at strengthening FOs (and under which the ASC are being renamed Agricultural Production Centers). Under the AMA program, and in concert with the IAES of the Agricultural Extension Department, development committees under the National Coordinating Implementation Centre (NCIC) are established at the ASC and district levels with the stipulation that over 50% of the committee members be FO representatives.

3) Rice Research Station (Ambalantota)

This research station was established in 1954 as a branch of the Batalagoda Rice Research and Development Institute (development of BG varieties), and at present operates under its own budget. Under the Research Officer at the center, there are 2 AIs, 3 KVSs, and 48 (of which 30 are women) farm staff. Annual center budget in FY 1995 was around Rs 2,500,000 of which more than half is for personnel costs. The center has an 11 ac (4.5 ha) experimental farm on which seed raising, yield and breeder seed experiments are carried out.

At present, 6 varieties of AT (Ambalantota) are being promoted as registered varieties, with the popular AT 353 and 4 month variety AT 402 being particularly well known.

Variety	Duration	Year recommended	Type	Yield	Special feature
AT 353	3.5 months	1992	red	6.2 t	Disease resistant
AT 354	3.5 months	1992	white	6.9 t	Salt resistant
AT 402	4 months	1992	long stalk red	7.7 t	Disease resistant
AT 401	4 months	1992	long stalk red	5.8 t	Salt resistant
AT 5	4.5 months	1992	white Basmate	6.0 t	Disease resistant
AT 303	3 months	1990	red	6.4 t	Disease resistant

4) Regional Agricultural Research and Development Centre (Angunakolapelessa)

This is one of the 6 regional research centers nationwide, and was originally established as a branch of the Mahailluppallama Agricultural Research and Development Centre. At present, however, it operates independently as the sole such research center in the southern region. Despite its excellent facilities, it suffers from manpower shortage.

Under the current center director are 4 professional researchers (horticulture, seed raising, water management, crop pest prevention) and 5 coordinating staff. Main activities of the center include banana research and extension, and seed raising in the area of horticulture, and new variety experimentation and seed production in the area of seed development.

As a result of intensive promotion of banana cultivation (at present 2,500 ha) under the Uda Walawe project, the Angunakolapelessa has become a major banana producing area in the country. At present, the center extends guidance to 300 farm households, with the maximum yield achieved being 50 t / ha / year.

Of the various varieties of banana, Kolikutt and Ambul are recommended for the area by the center; however, Cavendish (temperate climate oriented) and Ratambala (red banana) are not promoted.

5) Government Seed Farms

Government seed farms are located along national highway at 2 locations in the area, i.e. Bata-ata and Ambalantota. These farms engage in the production of BG and AT varieties. Warranty seed produced at the farms is then sold to the Agricultural Department, the DAS, and cooperatives, as well as to the farmers in general. At present, extension rate of warranty seed is 5~6%, which the government hopes to raise to 10% over the next 2 years with the ultimate goal of 50% of all paddy production (commercial varieties) being of superior varieties from warranty seed.

The 2 seed farms total 1,200 ha in size. In the 1995/96 rain season, 2,500 t of registered seed (for the production of warranty seed) was supplied to the AD, ASC, cooperatives, contract seed producing farmers and NGOs. This registered seed is capable of producing 100,000 t of warranty seed; however, quantity from contract seed producing farmers that underwent inspection was only 2,210 t.

OFC seed farms are located at Bata-ata and Middeniya and produce warranty seed for pulses, maize, kurakkan, peanut, chili and green vegetables. Produced seed is sold as well at the Bata-ata and Ambalantota seed farms.

6) Others

In addition, the Coconut Cultivation Board, The Department of Export Agriculture and the Department of Animal Production and Health provide agricultural support services.

The Coconut Cultivation Board maintains an office at each ASC and provides support not only to coconut plantations, but to small farmers as well raising coconut in home gardens (replanting assistance and guidance in cultivation and harvest).

The Department of Export Agriculture has an office at Tangalle in Hambantota district. Export crops in the area include, in addition to plantation crops such as

cinnamon, mainly sesame, etc. produced under chena cultivation. In collaboration with the AD, good quality seed are also provided to sesame export farmers.

The Department of Animal Production and Health mainly carries out preventive inoculation 1 time each year for the some 250,000 head (1995) of water buffalo and cattle in the district. These duties are attended to be 3 veterinary doctors, and animal husbandry extension staff (with motorbikes) assigned to the AGA office. An artificial insemination program is also underway as one component of the IRDP program under ADB financing.

(2) Marketing and Rural Credit

1) Paddy Marketing Board

This government agency has been established specifically for the purpose of paddy purchase from farmers, and is under the jurisdiction of the Ministry of Agriculture, Lands and Forestry. The board maintains branch offices at the district level, and buys paddy under the Guaranteed Price Scheme. The board also operates post harvest facilities such as rice mills and storages.

2) Multi-purpose Cooperative Societies

These cooperatives, like the Paddy Market Board, also engage in paddy purchase from farmers. They are quasi-governmental entities which rely on a portion of operating costs by collecting an annual membership fee of Rs 100 / person from member farmers, merchants, etc. In addition to buying paddy from the farmer, the cooperatives also supply to its members a wide range of items including agricultural production inputs (seed, fertilizer, agro-chemicals, etc.), food stuffs (rice, wheat, pulses, powdered milk, sugar, etc.), construction materials, general goods, etc. Also, Co-operative Rural Banks have been established under the cooperatives, which extend credit to cooperative members.

3) Co-operative Wholesale Establishment

The Co-operative Wholesale Establishment was created in 1949 as the oldest government run enterprise, and engages in the import, export, wholesaling and retailing of farm products. It is viewed by the government as playing a very important role in the marketing system for agricultural products. As of November 1994, the agency maintained a marketing network of 38 wholesale outlets and 130 retail outlets (including supermarkets) supplying subsidiary food crops, minor export crops, basic food stuffs, etc.

4) Ceylon Fertilizer Co., Ltd.

This organization imports chemical fertilizers and sells the same to the various agricultural support agencies. It is a government run enterprise with wholesaler authorization; however, a portion of its operations have already been privatized.

5) Ceylon Petroleum Corporation

The Ceylon Petroleum Corporation imports agro-chemicals and sells the same to the various agricultural support agencies. It is a government run enterprise.

6) Central Bank of Sri Lanka

Under various credit schemes aimed at the agricultural and rural sectors, the Bank not only oversees the extension of rural credit in the country, but is also plays an important role as a executing agency for funding programs by various international donor agencies.

2.4.4 Environment Related Agencies and Ordinances

(1) Agencies

Government agencies related to the scheme area environment area as follows.

At the central government level:

1) Central Environmental Authority
2) Wildlife Department
3) Coast Conservation Department
4) Department of Fisheries and Aquatic Resources
5) Ministry of Health, Highways and Social Services (MHHSS)
6) National Aquatic Resources Agency (NARA)
7) National Water Supply and Drainage Board (NWSDB)

At the Southern Province level

8) Agricultural Research Centre

At the district level:

9) Divisional Environmental Committee
10) District Agricultural Office
11) Divisional Malaria Office
12) District Fisheries Extension Office (DFEO)

Principal NGOs are:

Women's Development Federation
Sarvodaya

(2) Related Government Plans and Ordinances

1) Environmental Action Plan (1992~1996)

Sections under this plan with strong relevance to the Project are as follows:

a) Land Resources
b) Water Resources
c) Biodiversity and Wildlife

(3) Related Ordinances

Principal relevant legislation are as follows:

- Fauna and Flora Protection Ordinance, 1937
- Fisheries Ordinance, 1941
- Soil Conservation Act, 1951
- Forest Ordinance, 1970
- Plant Protection Ordinance, 1924
- National Environmental Act, No. 47 of 1980
- Pesticides Act, 1980
- Coast Conservation Act, 1980

2.4.5 Development of Policy for Participatory Type Management of Irrigation Systems

(1) System Management prior to the Appearance of the Participatory Type

Up until revision of a portion of the Irrigation Ordinance in 1994, irrigation law enacted in 1968 delineated the spheres of responsibility in the management of irrigation systems, assigning responsibility to the ID for the entire, with the exception of the 2 items below, management of major and medium schemes.

1) Farmers would be responsible for the cleaning and maintenance of field canals.

2) Cropping procedures and water distribution for each planting season would be decided in Kanna Meetings among the farmers, representatives of the related government agencies and other related personnel. (The said Kanna Meetings are organized by the District Secretary.)

Aside from the above, all other aspects of scheme management were to be the responsibility of the ID including principally the following:

- System operation under the cropping plan
- Water distribution
- O&M of branch canals (D-canals)
- O&M of main structures

Also, it was stipulated that the farmers were not to be required to pay for irrigation services.

(2) Deterioration of Irrigation Schemes

By the latter part of the 1970s, it was evident to the ID that numerous major irrigation schemes nation-wide were clearly experiencing serious deterioration. Although urgent countermeasures were necessary, it was recognized that these could not be effected with the IDs operating budget. To address the issue, a series of system rehabilitation projects were undertaken availing of funding assistance from various international donor agencies. The first basic model of the revolutionary "participatory type system management" emerged from among these projects.

(3) Emergence of the Participatory Type System Management

In 1978, the Deputy Director of the Irrigation Department's Kandy Range Office, in collaboration with concerned officials and personnel, embarked on a program to organize FOs for participation in the rehabilitation project for the Minipe major irrigation scheme. These organization efforts were widely perceived as a success, particularly with regards to the establishment of the Joint Project Committee comprised of ID staff and representative farmers.

Subsequently in 1981, with the commencement of the Gal Oya Water Management Project under international funding assistance, a plan was formulated by ARTI to organize and mobilize farmers for labor. In addition to providing many valuable lessons, this process left a valuable precedent wherein the organized farmers where able to resolve on their own conflicts over water distribution and use.

As a result of the achievements under system rehabilitation and improvement projects carried out with international donor agency assistance, such donors, particularly the World Bank, have come to strongly recommend to the Sri Lankan government that irrigation systems be able to operate and maintain themselves to the extent possible on their own. This in turn requires that at least a portion of system O&M cost be borne by the beneficiary farmers themselves.

(4) Emergence of the INMAS Program

In line with the above, the Sri Lankan government launched the Integrated Management of Major Irrigation Schemes (INMAS) program in 1984 based on its experience on the Minipe and Gal Oya projects. Originally, 48 schemes were selected to be covered under the program; however, this was later reduced to 35 schemes.

(5) Establishment of the Irrigation Management Division (IMD)

In order to effectively collect water tariffs under the INMAS program, the independently functioning Irrigation Management Division (IMD) was set up by the M/I, I&MD in 1984. The division is comprised of experts in a wide range of

disciplines, and its staff serve as Project Managers (PM) on the 35 schemes under the INMAS program. Each PM oversees the integrated management of the schemes in collaboration with the farmers and personnel of the related government agencies. During 1984~1985, the IMD formed numerous FOs in the Polonnaruwa area, contributing significantly to enhanced irrigation management.

(6) Achievements of the INMAS Program

The INMAS program was the first experiment in the participatory type system management for irrigation schemes, and has been widely hailed as a success. As of 1994, D-canal FOs have been set up in all 35 scheme areas (total of 1069 such FOs). In scheme areas as well, Joint Management Committees have been established. Of the 1069 D-canal FOs, 260 have formally contracted with the ID for transfer of responsibility for D-canal and below facilities. However, there still remain FOs which receive financial assistance from the ID.

(7) MANIS Program

AS the INMAS program is targeted at the larger scale irrigation schemes, the ID created a similar program in 1986 for medium scale schemes not covered under INMAS. This program is referred to as Management of Irrigation System (MANIS). Due to such factors as until recently the program has been carried out without reliance on external funding assistance, the ID has been unable to deploy a permanent staff to each scheme for the purpose of farmer organization. As a result, the success rate of the MANIS program is relatively less than that for INMAS. Although no official information is available, it is believed that farmer organization rate in 160 schemes under the program exceeds 50%; however, the establishment of Joint Management Committees is below 50%. Transfer of D-canal responsibility to the farmers is nil (IIMI, ARTI: 1993).

(8) Collection of Water Use Tariffs

In 1984, the government again started the collection of water use tariffs in the case of major irrigation schemes. At the beginning, the amount levied was 50% of the O&M cost (Rs 200 / ha), with the ultimate goal to steadily increase the same until the farmers bore the entire O&M cost. Collection rate at the start of the program in 1984 was 85%, but this declined to 10% by 1988 after which efforts at collection were suspended. The main reason for this suspension was the realization that the level of system improvement and operation was not commensurate with the farmers expectations given the amount of tariff being paid.

(9) Promotion of Participatory Type System Management

On the basis of a cabinet decision as a result of lessons learned from the failure of the above described collection program for water use tariffs, promotion of the participatory type system management was adopted as official government policy in December 1988. Specifically, this was defined as creation of FOs at the D-canal level, and transfer of responsibility for O&M of D-canals and F-canals to the farmers.

(10) Amendment of Related Legislation

With the adoption of the above policy, the government amended a portion of related legislation.

1) Agrarian Services Act (ASA)

In 1991, a part of the ASA was amended to accord powers of authorization to the Director of the DAS with regards to the legal registration FOs, particularly D-canal groups.

2) Irrigation Ordinance (IO)

In May 1994, a part of the IO was amended to include a legal authorization clause for farmer powers and activities under major irrigation schemes.

- Management rights are granted to D-canal FOs for D and F-canals. The said FOs are empowered to collect water use tariffs from the farmers.

- Decision making powers with regards to water management are accorded to the Project Management Committees (PMC).

At the same time, the right to exempt payment of water use tariffs is granted to the related government agencies.

(11) Principles underlying Participatory Type System Management

Implementation of participatory type system management is predicated on the following principles:

- Successful formation of FOs
- Establishment of Joint Management Committees
- Transfer of O&M responsibility for D-canals and below to the FOs. At the time of said transfer, a formal contract is signed between the FO and the ID.

2.4.6 Institutional Powers Related to Irrigation Agriculture

(1) Management Powers of Government Agencies

The principal government agencies with management powers under major irrigation schemes are the District Administration (DA), the Department of Agrarian Services (DAS) and the Department of Land Commissioner (DLC). The powers of the District Secretary are defined under the Irrigation Ordinance as follows:

- Amendment and collection of water use tariffs

- Establishment of District Agricultural Committees, convening of the same and appointment of committee chairmen

- Appointment of Advisory Committees for major irrigation schemes

- Convening of Cultivation (Kanna) Meetings and appointment of chairmen for the same

- Preparation of irrigation system construction plans

- General supervision of irrigation scheme management including surcharge against farmers failing to meet payment conditions under the Irrigation Ordinance

The above powers are exercised under the supervision of the Commissioner of the Department of Agrarian Services and the Secretary of the Ministry of Irrigation, Power and Energy.

From the above, it can be seen that almost all management powers with regards to the schemes have been delegated to the DA.

Powers of the Commissioner of the DAS, in addition to the above, are defined by the Agrarian Services Act as follows:

- Registration of farm land and collection of land taxes

- Supervision of Agrarian Services Committee and appointment of committee members

- Protection of the right of tenant farmers

- Registration and supervision of FOs

The above powers have been vested in the Commissioner of Agrarian Services in order to foster the earliest possible creation of FOs at the regional level, and protect the rights of the disadvantaged class of poor farmers.

An important article under the Agrarian Services Act is that concerning the "compensation by livestock owners for damage to farm land and irrigation facilities as a result of intrusion into such sites." This type of damage frequently occurs in the Study area, and control of this problem is a major issue in effective management of the systems following rehabilitation. However, this part of the above Act is seldom applied in practice, and a new approach is being sought from a socio-economic standpoint.

Farm land parceled out by the government under major irrigation schemes and national preserved areas are under the jurisdiction of the Land Commissioner. Land

survey, boundary demarcation, and resolution of disputes is under the Department of Land Commissioner in accordance with the State Land Ordinance and the Land Development Ordinance.

In many cases, resolution of land disputes take a long time. Also, the return of land which has been illegally settled in national preserves is difficult. Execution of these powers under the above ordinances is done by the LC field staff and the divisional secretary.

(2) FO Powers, Functions and Responsibilities

The legal framework regarding FOs is based on the Agrarian Services (Amendment) Act No. 4 of 1991. Under article 56A of the law, an FO must include at least ¼ of, and not less than 25 farmers, of the total farmers working the farmland in the area of jurisdiction of the said FO. Registration is by application.

Registration of FOs in major irrigation scheme areas is done with the consent of the Secretary of the MIP&E. This registration system is coordinated with the objectives of the INMAS and MANIS programs regarding system operation, maintenance and organization.

Election of FO officers and FO activities are in accordance with the procedures stipulated by the DAS.

Following their creation, FOs engage in a range of agricultural related activities. Once the FO has become established in the community and has reached an appropriate level of organizational maturity and firm financial base, it can apply for registration and approval to engage in economic activities under the Agrarian Services Act , Article 56B. Under section 6 of this article, the Director of DAS can cancel such registration if for 2 years the FO engages in no such activity, and there is no opposition by the member farmers of the FO to such cancellation.

The powers and functions of the FOs under the Agrarian Services Act are stipulated as follows.

- Formulation and implementation of agricultural programs
- Construction and repair of irrigation facilities at the village level
- Purchase of agricultural inputs, and marketing of agricultural products
- Liaison between the farmer and the concerned government agencies
- Pursuit of various economic activities for the benefit of the member farmers as approved by the DAS

In addition to the above, the amended Irrigation Ordinance of 1994 stipulates the following powers to vested in the FOs:

- The FOs are to have the same powers under the Irrigation Ordinance as are accorded to the Cultivation Committees.

- In the case of FOs which assume full responsibility for O&M of a portion of the irrigation system, these are to be exempted from the payment of water use tariffs.

- In the case of FOs to which responsibility of O&M of facilities has been transferred to them, these are to have the power to collect related O&M costs from the farmers.

- Where failure to pay required fees has occurred, the FO can report this to the District secretary for assistance in retrieving the same.

The important function of the FO is to convene cultivation meetings, and in collaboration with the staff of the concerned government agencies, ensure that the seasonal cultivation plan is carried out in accordance with the Irrigation Ordinance and the Agrarian Services Act. Furthermore, well organized FOs also perform the following.

- By active voicing of group ideas and opinions, contribute to improving the overall welfare of rural society.

- Achieve a consensus among the farmers regarding such potential contentious issues in the cultivation meetings such as the seasonal cultivation plan, particularly with regards to scope of cultivation, cropping pattern, and water distribution.

- Carry out the decisions of the cultivation committee, in collaboration with the concerned government agencies.

These functions are essential to wise water management and cultivation practices necessary to improve agricultural production.

Approval for FOs to engage in economic activities

Principal economic activities for which FOs receive approval to engage in are as follows:

- The FO can enter into contract with the ID for repair and rehabilitation of the irrigation system. Such contracts cannot exceed 3, and contract amount for a single contract cannot exceed Rs 250,000. Standard government procedure for contracting can be waived in the case of these contracts.

- The FO can purchase paddy from the farmers on behalf of the Paddy Marketing Board, at the government purchase price.

- The FO can act as a wholesale purchasing agent of agricultural inputs (fertilizer, agro-chemical) at discount prices.

FO responsibilities

The FOs are responsible for reporting to upper government agencies regarding any problems occurring in their areas of responsibility. This is considered extremely important in the FO's role as acting on behalf of not just the individual farmer, but on behalf of the community as a whole.

(3) Powers, Functions, Responsibilities of the Project Management Committees (PMC)

The PMC were first conceived under the INMAS program. Their purpose is to integrate the various FOs existing within a single scheme area, in order to facilitate effective irrigation management.

In the initial stages, FOs were not necessarily representative of their respective areas, the Project Manager appointing the FO representatives as well. After that, FOs evolved to a point where farmer representative were elected from within the D-canal and F-canal groups. The farmer representative to the PMC was subsequently elected from among the D-canal group representatives.

Under the amended Irrigation Ordinance of 1994, the PMC was vested with legal powers in the case of the multi-provincial schemes. In the case of provincial level schemes, the PMC was according powers equivalent to the Provincial Council.

The following are stipulated with regards to PMCs under the Irrigation Ordinance (amended).

Member composition

- Farmer representative to the PMC must come from areas where farmer participation in the area FOs is at least 50%.

- The Project Manager appointed by the Secretary MIP&E is to serve as either the chairman or secretary of the PMC

- The PMC also has as members representatives of the following:]

    - ID Director
    - DAS Director
    - AD Director
    - Commissioner of Cooperative Development
    - Representatives of related agencies, determined by Secretary/Irrigation
    - Divisional Secretary of the scheme area

Powers:

- Has the power to set up sub-project management committees (SPMC) which shall be presided over by a representative of the FO

- Has the power to coordinate all project management activities in the area

- Make recommendation to the Divisional Secretary / District Secretary about the seasonal cultivation calendar, cropping pattern and arrangements regarding annual maintenance. Upon receiving a recommendation at (4) above, the Divisional / District Secretary shall summon a special meeting of the PMC to function as a Cultivation (Kanna) Meeting as provided in the Irrigation Ordinance. The PMC there upon can exercise the powers of all the farmers in the area.

- The PMC takes up issues raised by DCOs and SPMCs relating to all operational and development issues. In addition, the PMC is able to take up with government officials numerous policy issues which impact on these economic activities such as agricultural pricing, input costs, etc.

Responsibilities:

In this way, the PMC becomes a legally recognized forum where FO representatives and public officials including the Divisional Secretary participate in decision making as equal partners.

Principal responsibilities of the PMC are:

- Preparing a seasonal plan and monitoring it

- Creating a participatory management environment giving the farmers sense of ownership and accountability for their system and for their actions

The above are vital for improving water use efficiency, agricultural productivity and overall performance of the system.

CHAPTER 3

CHAPTER 3 EXPERIENCE AND LESSONS RELATED TO REHABILITATION

Over the past 15 years in Sri Lanka, a number of large scale, irrigation scheme rehabilitation projects have been carried out. The Study Team examined these, and experience and lessons gained from them were applied to planning under this Study.

3.1 Irrigation Rehabilitation Projects

Lessons and experience from the following 4 projects were used as reference under this Study.

Project	Irrigated area	Implementation period	Donor agency
(1) TIMP: Tank Irrigation Modernization Project	12,753	1976~1982	World Bank (project marks the first large scale rehabilitation project in the
(2) Gal Oya Water Management Project	23,000	commenced in 1985	USAID (one of the largest rehabilitation projects in the country)
(3) MIRP: Major Irrigation Rehabilitation Project	46,240	1985~1992	joint funding by IDB, CIDA, SDC
(4) Uda Walawe Rehabilitation Project	17,000	commenced in 1985	ADB (located in southern dry zone)

(1) Tank Irrigation Modernization Project (TIMP)

The project is targeted at 5 major irrigation schemes in the northern dry zone which suffer the effects of drought every 5 years, with resultant agricultural production being heavily dependent on fluctuations in rainfall. The framework of the project, based on the agroeconomic data from the area, embraces a wide range of components including ① improve irrigation and drainage facilities, ② construct farm roads, ③ procure of rice paddy tilling equipment (2 wheel tractors, etc.), ④ strengthen farmer support, and ⑤ to provide technical assistance in strengthening O&M systems.

Project formulation was participatory, with the beneficiary farmers cooperating with the relevant government staff in planning the system improvement. However, the lack of farmer organizations at the outset of the project was the greatest constraint on full farmer participation in the project.

Under the project, annual cropping rate is to be raised from 83% to 170% over a 5 year period, with paddy production in the Maha season to be improved from 1.7 t/ha to 3.4 t/ha, and that in the Yala season by 5.4 fold. This would fundamentally improve the agricultural production pattern in the area, with farmer income at prices at the time of the project to increase from Rs 2,850 to Rs 7,650 p.a.

Improvements under farm management and cultivation technology included moving the timing for tilling of paddy fields forward to maximize effective use of initial rainfall in the Maha season, direct broadcast of ungerminated seed on dry soil, and introduction of short duration varieties (3~3.5 months) to reduce the length of the irrigation season. To support this, greater farm mechanization through the introduction of tractors, introduction of a rotation system of water distribution and research and development of short duration paddy varieties were also planned under the project.

Rehabilitation of irrigation facilities comprised installation of discharge regulating gates, installation of discharge gauging equipment, introduction of rectangular canals, construction of lined canals (to prevent seepage), improvement of farm pipe outlets, and implementation of rotational irrigation (12 hour daily).

Of the total project cost (US$ 30 million in prices at the time), civil construction works and equipment procurement comprised 85%. Irrigation improvement components accounted for only 29% of the total project cost. A major foreign exchange component was allocated for importing machinery and vehicles. From its initial stages the project suffered problems. Low investment in facility rehabilitation and water shortages in the region resulted in irrigation discharge not reaching the farmers and this was compounded by a lack of understanding on the part of the farmers of the modern irrigation technology designed under the project.

(2) Gal Oya Water Management Project (GOWMP)

The goal of this project, targeted at 23,000 ha, is to redesign and repair the main canal and distribution canals (D-canals) to bring them back to a level of function originally intended. A water management plan was prepared to minimize water loss along canals, and a training program in water management implemented which was aimed at Irrigation Department personnel, farmers and other related persons. This training program was to be supported by the Galgamuwa Irrigation Training Institute (Kurunegala district) established by the Irrigation Department. The project also had as its target the organizing of farmers and conducting of socio-economic research relating to the development of farmer organizations or local water users associations.

The development strategies adopted in Gal Oya were influenced by TIMP and other experiences, particularly with respect to issues such as beneficiary participation as well as capital costs and operation and maintenance costs. The emphasis on farmer involvement intensified with the participation of the Agrarian Research and Training Institute (ARTI) and Cornell University in project implementational activities. The overall planning process underlying the project reflects a high degree of flexibility. Of total project cost (US$ 18.34 million), 61% is allocated to technical assistance, commodities, training, and personnel, while 16% is allocated to rehabilitation construction works.

Evaluation by the International Institute for Science (ISTI) of the project in 1985 indicated the following.

1) Rehabilitation of a badly deteriorated major irrigation system in a cost effective manner

2) Practical rehabilitation incorporating local know-how and beneficiary participation

3) Farmer participation from the initial design stage

4) Formation of viable farmer organizations

5) Increased yields and cropping rates through improvement of farm management practices

Based on the above findings, ISTI concluded that the project had substantially achieved its objectives, and can be replicated to manage large irrigation schemes in Sri Lanka in a sustainable manner.

(3) Major Irrigation Rehabilitation Project (MIRP)

The original project plan covers 7 major irrigation systems with total benefit area of 46,240 ha. However, three of these schemes have been halted due to civil disturbances. MIRP is primarily aimed at increasing agricultural production in the irrigation schemes mainly through improvements in water control and management. Specific components of the project to achieve this are as follows:

1) Rehabilitation of physical irrigation systems for optimum utilization of water

2) Development of institutional organizations in each of the schemes.

3) Rehabilitation of roads and regularization of encroached lands.

4) Undertaking investigations on catchment management and socio-economic studies.

5) Strengthening agricultural support services and input supply.

In four of the schemes of MIRP, an experimental area covering about 150-200 ha per scheme has been identified to serve as a pilot program for testing selected technical options, mainly new types of irrigation structures for improving irrigation water control and delivery in the scheme.

The approach adopted in MIRP differs sharply from that of TIMP. The practice of nighttime rotation irrigation has been altered to the daytime. Also, discharge regulation gates were installed on main canals. Although TIMP relied very heavily on weir boxes for measurements at distributary canal and field canal levels, MIRP has installed broadcrested weirs.

The executing agency of MIRP is the Irrigation Management Division (IMD), but all civil works are undertaken by the Irrigation Department. The project organization is also linked to the Integrated Management of Major Irrigation Systems (INMAS) Program. Total project cost is US$ 43.2 million, of which construction works account for 70%. The project has not been assessed as very successful due little change in the pre-project levels of agricultural production, cropping rate, cash crop yield, etc. One reason for this is a high dependency on supplemental water supply from outside (Mahaweli). Crop diversification does not seem to have achieved much sustained success under MIRP.

(4) Uda Walawe Rehabilitation Project

The Uda Walawe Irrigation Scheme, located upstream of the Liyangastota scheme, was initiated in the 1960s. The total command area of the project is about 17,000 ha. Subsequently, the project was reassessed in the 1970s and in the 1980s, a feasibility study was undertaken. The feasibility report focused mainly on the irrigation discharge under the original plan.

Some of the specific issues mentioned in the report are: reduction of conveyance losses under the irrigation system, water management in area of permeable soil with an objective to increase efficiency of water use, review of the original parameters for water distribution, study of regulating facilities, and improvement of O&M.

The specific approaches adopted by the rehabilitation project can be summarized as follows:

1) Physical improvements in the conveyance system, including rehabilitation of structural defects in the main system and the branch canal system.

2) Improvements in the water distribution system through rehabilitation of the distributary-canal and field-canal systems, including the installation of field canals parallel to the distributary canals.

3) Improvement of O&M activities.

4) Rehabilitation of roads.

5) Improvement of domestic water supply by providing wells.

6) Provision of equipment and vehicles.

The preparation of project development plans reflects a strong top-down approach, with little information from and participation of those at the project and field levels.

Studies conducted by IIMI (International Irrigation Management Institute) indicate that the basic problems affecting the project stem from management and organizational issues (IIMI 1990). Conclusions cited by IIMI with regards to the project include:

1) A participatory study method was not adopted regarding water management
2) Related personnel from the concerned government agencies did not accord any decision making powers to the beneficiary farmers
3) From the initial stages of the project, there was no farmer participation in O&M planning for main and branch canals.

3.2 Participatory Management Programs

The participatory management programs related to this Study are:

(1) INMAS program (Integrated Management of Major Irrigation Systems)

(2) MANIS program (Management of Irrigation Systems)

(3) ISMP program (Irrigation Systems Management Project)

(1) INMAS Program

The Integrated Management of Major Irrigation Systems (INMAS) program came about as a result of a growing awareness in the 1980's that farmer participation was essential to effective management of irrigation systems. The program is targeted at large scale irrigation systems nation-wide, from among which 35 candidate schemes were selected and the active participation of beneficiary farmers promoted through establishment of a joint farmer / government management framework for unified O&M activities under the schemes. The program aims at enhanced efficiency and sustainability of system O&M basis on organization of farmer groups. Preceding the start of the program, the Ministry of Irrigation established the Irrigation Management Division (IMD) to function as the central agency for execution of the program beginning in 1984.

Focus under the program is given to the following 2 long-term goals:

1) The integrated development of farm holdings through crop diversification, agro-processing / marketing and other diversified activities

2) Eventually turn over to the farmer organizations all of the management and operational functions of the projects.

In order to achieve the above, the program combines the following components:

1) Increasing agricultural production per unit of irrigation water and per unit of land

2) Adequate and equitable distribution of irrigation water to farmers

3) Arrange for funding supply of agricultural inputs and for marketing

4) Develop farmer organizations to participate in management

5) Maintain the irrigation system at optimum levels of performance

6) Identify major systems needing rehabilitation

(2) MANIS Program

The MANIS program has been carried out by the ID since 1986 targeted at medium scale irrigation schemes which do not fall under the umbrella of the INMAS program (aimed at large scale schemes). In principal, the goals of farmer organization under the MANIS program are the same as for the INMAS program.

The IMAS and MANIS programs are currently being implemented in the Study area. Programs in effect on a scheme-wise basis are as follows:

Scheme	Sub-scheme	Organizer	Program
Liyangastota:	Walawe LB	IMD	INMAS
	Walawe RB	ID	MANIS
Muruthawela Reservoir:	Muruthawela LB	IMD	INMAS
	Urubokka Oya	ID	MANIS
	Kirama Oya	ID	MANIS
Badagiriya:		IMD	INMAS

(3) ISMP Program

This program was commenced in 1986 with assistance from USAID, and is based on experience from the previously discussed Gal Oya Water Management Project. The program applies to schemes an irrigation system management and rehabilitation approach centered on FO participation.

The program is targeted at 6 scheme areas in the 3 districts of Ampara, Polonnaruwa and Kurunegala.

It aims to permanently establish in the future a high level of water management in the scheme areas, with the objective of rectifying the low productivity under large scale irrigation and settlement projects (with the exception of Mahaweli) carried out in the past by the government. The program is predicated on the conclusion that low scheme productivity is mainly the result of organizational and management deficiencies, and that the a mechanism for maximum farmer participation is essential.

The program is operated under the INMAS program being promoted by the ID. Under the ISMP program, a PMC (Project Managing Committee) is set up in the scheme area and comprises a Project Manager, farmer representatives, and other field

staff from concerned government agencies. At the field level, farmer participation via FOs in facility operation and maintenance is promoted. The Project Manager is responsible for organizing farmers, facilitating their participation in the schemes, and conducting relevant farmer training with regards to system management.

Program components include the following:

1) Creation and strengthening of FOs

2) Improvement of O&M of the irrigation schemes

3) Strengthening of the financial base of management systems by farmer participation in bearing a part of costs for O&M

4) Project monitoring and performance assessment

5) Strengthening of relevant training programs

6) Effective application of available information and data to project management

The program focusing on rehabilitation which meets the following 2 criteria:

1) ESI, or essential structural improvement

2) Pragmatic rehabilitation

3.3 Assessment of National Irrigation Rehabilitation Project (NIRP)

(1) Current Status of Progress

The National Irrigation Rehabilitation Project (NIRP) was initiated in 1991 under financing mainly from the World Bank, and is aimed at the rehabilitation irrigation facilities nationwide. Project cost is US$ 49.8 million (of which US$ 29.6 million is extended by the World Bank), targeted at 37,500 ha and with an original implementation period of 7 years (1991~1997). Executing agencies of the Sri Lankan government include the External Resources Department (ERD), the World Bank Colombo Office, the Irrigation Department (ID), the Provincial Engineering Unit (PEU) and the Department Agrarian Services (ASC).

A funding agreement was signed for the project in 1991, and actual project works commenced in October 1992. Project implementation period has been revised for completion of construction on June 30, 1998. However, rate of progress has been extremely low, and the Sri Lankan government is under pressure from the donor agencies to address this issue. In line with this, a World Bank appraisal mission reassessed the number of schemes to be covered under the project in 1994 as indicated below.

Class of project	Original	Revised (1994)	Executing agency
Major and medium projects	60 schemes	35 schemes (12,034 ha)	ID : 35 schemes (100%)
Minor projects	1,045 schemes	889 schemes (20,000 ha)	ID : 257 schemes (29%) PC : 405 schemes (46%) AS : 227 schemes (25%) Total : 889 schemes

ID : Irrigation Department
PC : Provincial Council
AS : Agrarian Services

Rate of project progress is as shown below. (as of February 1996, unit : %)

Class of project	ID	PC	AS
Major~medium projects (35 schemes)	not yet started: 13 schemes (37%) less than 50%: 18 schemes (52%) less than 50%: 4 schemes (11%)	--	--
Minor projects (889 schemes)	57%	39%	28%

note: In the case of progress rate for minor projects, status of progress was divided into 5 stages of under study ~ under design ~ under tendering ~ under construction ~ completed, with degree of completion computed in terms of percentage of design benefit area.

(2) Agency Evaluation of the Project

The assessment by the World Bank mission (1994) reports a low progress rate of 13% completion of the original planned project. The JICA Study Team received the following comments from the various concerned agencies regarding the reasons for this low achievement rate (as of February 1996).

1) Comments by the External Resources Department (ERD)

- Late establishment of project office
- Late appointment of project director
- Late selection of candidate schemes for rehabilitation, and drastic modification of candidate scheme areas
- Numerous delays in design works

- Failure to transfer budget executive and decision making powers to the project director
- Inadequate provincial government staff involved in budget preparation
- Various problems emanating from existence of special farmer organizations

2) Comments by the World Bank

- Late selection of local consultant by the Sri Lankan government
- Late selection of candidate schemes for rehabilitation by the provincial government
- Late procurement of related project study materials and equipment (expenditure on 30% of total budget allocated)
- No improvement in agricultural productivity observed (either quantity or quality)

3) Comments by the Irrigation Department (ID)

- Late selection of consultant
- Inadequate provincial government staff involved
- Difficulty in procuring adequate budget to meet construction schedule
- Lack of construction contractors in remote areas
- Difficulty in obtaining fee gratis labor from FOs equivalent to 10% of construction cost

4) Comments by Southern Provincial Engineering Unit (PEU)

- Difficulty in obtaining fee gratis labor from FOs equivalent to 10% of construction cost (2% at outset of civil works, and 8% during construction period)
- Delays in study execution due to shortage of vehicles and staff, leading to subsequent delay in contract for construction works

5) Comments by the Department of Agrarian Services (DAS)

- Delays in transfer of responsibilities under the project from PEU to DAS (DAS is responsible for coordinating with FOs and assignment of agricultural instructors)
- Strong inclination on the part of PEU technical staff to contract works out to private sector construction companies as opposed to farmer organizations (almost none to FOs)

3.4 Lessons Learned

Lessons learned from the (i) 4 irrigation rehabilitation projects previously carried out, (ii) 3 participatory system management programs currently in progress, and (iii) National Irrigation Rehabilitation Project (NIRP) carried out nation wide, which can be applied to the Study area are summarized below.

(1) Beneficiary farmer participation should occur from the initial stages of project formulation.

(2) Programs need to be effected which strengthen the activities of FOs and promote their participation in facility O&M.

(3) Rehabilitation should be pragmatic and cost effective.

(4) Full cooperation of the Sri Lankan government is necessary in ensuring the effective function and coordination of the related executing agencies.

CHAPTER 4

CHAPTER 4 STUDY APPROACH AND EXECUTION STRATEGY

4.1 Promotion of Participatory Type Study

Further building on the participatory type study begun under Phase I, the Study components indicated below were carried out in order to identify rural social conditions in the target scheme areas, farming systems, rehabilitation requirements, priority issues to be addressed under the Project, and institutional and farmer capabilities. In order to assess the basic participatory type project framework at the end of the Phase II field survey, a workshop sponsored jointly by the JICA Study Team and the Irrigation Department was held. The theme of the workshop was "sustainability of major irrigation management systems after rehabilitation", and the workshop was attended by related officials of related government agencies and other persons concerned with irrigated agriculture.

In addition to the exchange of ideas with regards to the above theme, the workshop also served as a forum for discussion with personnel at the decision making levels of the related agencies thereby deepening their understanding of the Project.

Study components were as follows:

(1) Confirmation of FO unit areas of jurisdiction and D-canal benefit areas

(2) Rapid Rural Appraisal (RPA)

① Baseline survey
② Participatory rural appraisal (PRA)

(3) Diagnostic Analysis of Present Status (DAPS)

① Working advisory committee (WLAC) meeting
② Reconnaissance survey (joint)
③ Study advisory group (SAG) meeting

(1) Confirmation of FO unit areas of jurisdiction and D-canal benefit area

The following were carried out to confirm the jurisdictions of individual FOs and delineation of D-canal benefit areas as a basis for the subsequent RPA and DAPS.

- Boundaries for D-canal benefit areas where entered jointly by the Study Team, ID personnel in charge and representative farmers on 1/5000 scale topomapping prepared under Phase I study. In principle, D-canal FO areas and D-canal benefit areas should coincide, however, there were cases where this was not so.

- In order to clarify many remaining points with regards to the above, a meeting of all FOs in the scheme area was convened, and a foot survey of the scheme

area was done accompanied by the farmers. This was a basis for preparation of mapping indicating D-canal benefit areas and FO unit areas. Confirmed numbers of FOs in the scheme areas are as follows:

Number of FOs in Scheme Areas

Scheme		FO units
Liyangastota	Walawe RB	30
	Walawe LB	24
Total		54
Muruthawela	Muruthawela LB	27
Reservoir	Urubokka Oya	22
	Kirama Oya	22
Total		71
Badagiriya		4
Grand total		129

(2) Rapid Rural Assessment

1) Baseline survey

The RRA comprises a baseline survey and a participatory rural appraisal. The baseline survey is done by questionnaire distributed by FO representatives.

Numbers of respondees to the questionnaire were calculated by scheme location and conditions therein, examined on the basis of the previously described mapping (1/50,000) of FO unit areas in order to prevent distortion or eccentricity, and provide as broad and balanced a body of data as possible.

The questionnaire was distributed to an average 12 farm households within each FO, for a total of 307 households out of the total of 1,200 for all 3 scheme areas. Number of sampled FOs in each scheme area are indicated below.

Number of Sampled FOs

Scheme		Total FOs	No. sampled
Liyangastota	Walawe RB	30	4
	Walawe LB	24	4
Total		54	8
Muruthawela	Muruthawela LB	27	5
Reservoir	Urubokka Oya	22	5
	Kirama Oya	22	5
Total		71	15
Badagiriya		4	2
Grand total		129	25

2) Participatory Rural Appraisal (PRA)

The purpose of the PRA is to provide a close check of the results of the baseline survey, and to identify and elicit the needs and the attitudes of the most disadvantaged class which could not be covered under the questionnaire survey.

The appraisal was carried out by direct verbal dialogue with residents of the scheme areas, selected so as not to be redundant with the FO unit areas under the baseline survey, and taking into consideration locational factors (upstream, middle reaches, and downstream of scheme area, etc.) as well. Although participation of women was encouraged, in fact the number was small. Numbers of targeted FOs and actual attendees at the convened meetings are indicated below.

Targeted No. of FOs and Number of Meeting Attendees

Scheme		No. of FOs targeted	No. of attendees	
			Male	Female
Liyangastota	Walawe RB	5	76	
	Walawe LB	6	87	
Total		11	163	
Muruthawela	Muruthawela LB	2	47	
Reservoir	Urubokka Oya	6	62	
	Kirama Oya	5	53	
Total		13	162	5
				5
Badagiriya		4	58	9
Grand total		28	383	14

(3) Diagnostic Analysis of Present Status (DAPS)

1) WLAC Meeting

The DAPS is carried out under the recognition that the basis for formulating the optimum rehabilitation plan lies in a quantitative analysis and identification of problem issues with regards to the present status of the scheme areas (system functions, FO activities, agricultural production, O&M, etc.). In eliciting problem issues, Working Level Advisory Committees (WLAC) comprised of farmer from the entire scheme area, the regional ID office, and concerned personnel of other related agencies were set up for each scheme. The locations of farmer related systems were delineated on scheme maps, and the specifics of farmer aspirations and attitudes confirmed through the committee participants. Likewise, the understanding of the concerned personnel of the relevant government agencies was also solicited. Problem issues so identified by the committees were given priority during the field survey.

2) Reconnaissance Survey

In the course of reconnaissance survey, particularly regarding system functions and capacity, the participation of the farmers was sought. By accompanying farmers on foot tours of the systems, every effort was made to absorb their collective experience and specifically sound their aspirations with regards to the Project.

3) Study Advisory Groups (SAG) Meeting

Problem issues with regards to institutional policy towards the schemes were examined by study advisory group meetings attended by decision makers of the related government agencies.

Main topics of focus were "views and strategy towards official incorporation of Tract 1 in the Muruthawela LB scheme", "government policy regarding environmental assessment procedure", etc.

4.2 Workshop

A workshop with the theme of "sustainability of participatory management for major irrigation systems after rehabilitation" was held jointly by the Study Team and ID on April 9, 1996 at the International Irrigation Management Institute. In attendance were 31 irrigation related specialists for various government agencies. The workshop provided a successful forum for very active and constructive discussions. In the course of the workshop, the Study Team presented the findings of its field survey with regards to agriculture, FOs, rural society, environment, system O&M, etc.

In particular, the Study Teams proposals on capacity building regarding IDs in-situ system O&M activities prompted vigorous discussion and highly favorable response.

The workshop provided a vehicle for further deepening the understanding of concerned personnel and decision making level officials regarding the proposals of the Team as a result of its study.

CHAPTER 5

CHAPTER 5 PRESENT CONDITIONS IN THE STUDY AREA

5.1 Socio-economy

5.1.1 Study Method

A baseline survey was carried out by questionnaire directed at 307of the 19,200 farm households in the benefit areas under the Liyangastota, Muruthawela Reservoir and Badagiriya schemes. A cross-section by FO and by social class was striven for, and breakdown of the sample number by scheme is 86 households in the Liyangastota scheme area, 200 households in the Muruthawela Reservoir scheme area and 21 households in the Badagiriya scheme area, which comprise 1.0%, 2.0% and 3.8% of the total households of these areas respectively.

A 2 stage selection process was applied in selecting the households. Firstly, 25 FO units (8 under the Liyangastota scheme, 15 under the Muruthawela Scheme, and 2 under the Badagiriya scheme) representing the particular characteristics of their areas were selected on the basis of criteria of irrigation water supply (shortage / excess), irrigated area, no. of member farmers in the FOs, etc.. From within these units, sample households were then selected applying criteria of land conditions (upstream or downstream part of scheme), land ownership pattern, membership in FO, etc. In the case of the interview survey conducted at the same time as distribution of questionnaires, farmers were spoken to in private without the presence of FO representatives or staff of government agencies in order to elicit the most frank and unreserved responses possible.

Principal items under the base line survey include demography, land ownership patterns, WID, poverty, and rural infrastructure. Survey results area indicated below.

5.1.2 Demography

(1) Average Household Size

Average household size is as shown in Table 5.1.1-1

Table 5.1.1-1 Population, Nos. of Households, Average Household Size

Scheme	Population	No. of households	Average household size (persons)
Liyangastota	46,500	8,700	5.34
Muruthawela Reservoir	55,600	9,930	5.60
Badagiriya	3,100	560	5.54

(2) Age-wise Population

Persons 55 years or over in age account for an average 16% of the total population of the 3 scheme areas, with aging of the population particularly significant in the Liyangastota scheme area.

(3) Unemployment

It is reported that the incidence of poverty in the district is at a high level among the other districts of the Southern Province. Behind this is a high unemployment rate, with latent full unemployment and incomplete employment seen as widespread centering on young persons (15~24 years old) with high levels of education. On the basis of the base line survey, estimated unemployment rates (unemployed among the labor population between 15 and 54 years of age) are 31.4% for the Liyangastota scheme area, 26.7% for Muruthawela Reservoir, and 33.9% for Badagiriya. In the Badagiriya benefit area there is a serious labor shortage; however this is attributed to migration outside the area (to other parts of Sri Lanka, and abroad). District data indicate as well that this area has the greatest percentage of workers going overseas.

5.1.3 Land Ownership Pattern

The benefit area of Ridiyagama tank under the Liyangastota scheme, the Tract I and Tract II areas under the Muruthawela Reservoir scheme, and the benefit area under the Badagiriya scheme are all settled areas, and land in the command area of the medium~minor tanks and anicuts is privately held land.

Scale of land holdings in the 3 scheme areas is 3.1 ac, and roughly 50% of the farmers are tenants. Scheme-wise, landholder farmers are most numerous, accounting for 96.5% of the scheme land, while in the case of the Liyangastota and Muruthawela Reservoir schemes the proportions are 36.1% and 35.3%, respectively. Tenant farmers (Ande) account for 52.8% of the land under the Muruthawela Reservoir scheme, 49.4% under the Liyangastota scheme. Illegal cultivators are most numerous in the case of the Muruthawela Reservoir scheme, accounting for 0.6% of the land.

5.1.4 WID

Contribution by women to farm labor averages 150-200 person days per household. On an individual basis, this represents around 100 days / year per person. Roughly 23% of the housewives in the scheme areas carry out household chores such as cooking, water fetching, collecting firewood, etc. in addition to their farm chores. Although around 25% belong to women's organizations, participation in FOs is low. Work outside of agricultural labor generally comprises low paying cottage-type industries. The foregoing is attributed to the seasonally intensive nature of agricultural activities.

5.1.5 Measures to Alleviate Poverty

Under the Samurdhi Programme to replace the Janasaviya program, income subsidies of Rs 1,000 and Rs 500 per month are extended to impoverished households with income under Rs 500 and 500~1,000 per month. Payments of Rs 200 per month are also made to kernel families (2 members), and payments of Rs 100 per month to monks, the elderly and the handicapped.

Recipients under the Samurdhi Programme are estimated to comprise 39.2% of the population in the Muruthawela Reservoir scheme area and 12.6 % in the Liyangastota scheme area, highlighting the areal difference in standards of living.

5.1.6 Socio-Economic Infrastructure

(1) Roads and highways

In the case of C-class and below roads in the Study area, a combination of inadequate maintenance and repair and the fact that roads are traversed by trucks and 4 wheel tractors overloaded with agricultural produce and inputs has resulted in road surface damage, and at locations pavement materials are exposed in places. As a result there is concern for load damage to agricultural products. In the Kirama Oya sub-scheme under the Muruthawela Reservoir scheme, farm roads are lacking and in this area particularly farmers are hopeful that such roads be constructed under the Project.

(2) Water Supply

In the case of water for domestic purposes, supply is by water service facilities (including common hydrants) in urban areas and by unprotected wells or river sources in rural areas. Use of wells averages 87.7% for the 3 scheme areas, with reliance on unprotected water sources being highest for Muruthawela Reservoir scheme at 29.1%.

(3) Electrification

Electrification rate is highest at 44.2% for the Liyangastota scheme and lowest at 24.9% for the Muruthawela Reservoir scheme. Unelectrified areas rely on oil lamps, etc.

(4) Education

In rural area, failure of children to enroll for compulsory education (10 years from age 5) is a serious problem. Causes for this are use of children for agricultural labor, low incomes, and poor access to schools. Unenrolled rate averages 10.6% for all 3 schemes, being lowest at 8.5% for Liyangastota, and highest at 12.5 for Badagiriya. On the other hand, of enrolled children, around 33% achieve the higher education level of over grade 10. This is an extremely high rate compared to the district average of 14%, indicating a strong awareness of the importance of education among residents in scheme areas.

(5) Medical Services

Under the district government are national hospitals, private hospitals, free dispensary clinics and Ayurvedic hospitals; however, these facilities are deteriorated and cannot adequately fulfill their originally intended level of treatment. Incidences of tropical fevers, gastric-enteritis, malaria, etc. are serious, reaching an average 25% illness rate in the Project area, and urgent upgrading of medical facilities targeted at impoverished tenant and landless farmers is essential.

5.1.7 Other Socio-Economic Conditions

(1) Assets

Against a background of increasing farm mechanization, ownership rate for 2 wheel tractors is highest for the Liyangastota scheme area at 45% and lowest for the Muruthawela Reservoir scheme area at 18%. Ownership rate for agro-chemical sprayers is highest for the Liyangastota scheme area at 53% and lowest for the Badagiriya scheme area at 38%.

(2) Housing

The typical dwelling of the area comprises 66% of the housing, with 14% being temporary houses. Cement flooring rate is 73%, and rate of roofing by tile or asbestos is 83%. 76% of houses are brick or concrete block construction. Toilet facility extension rate has reached 97%.

5.2 Agro-economy

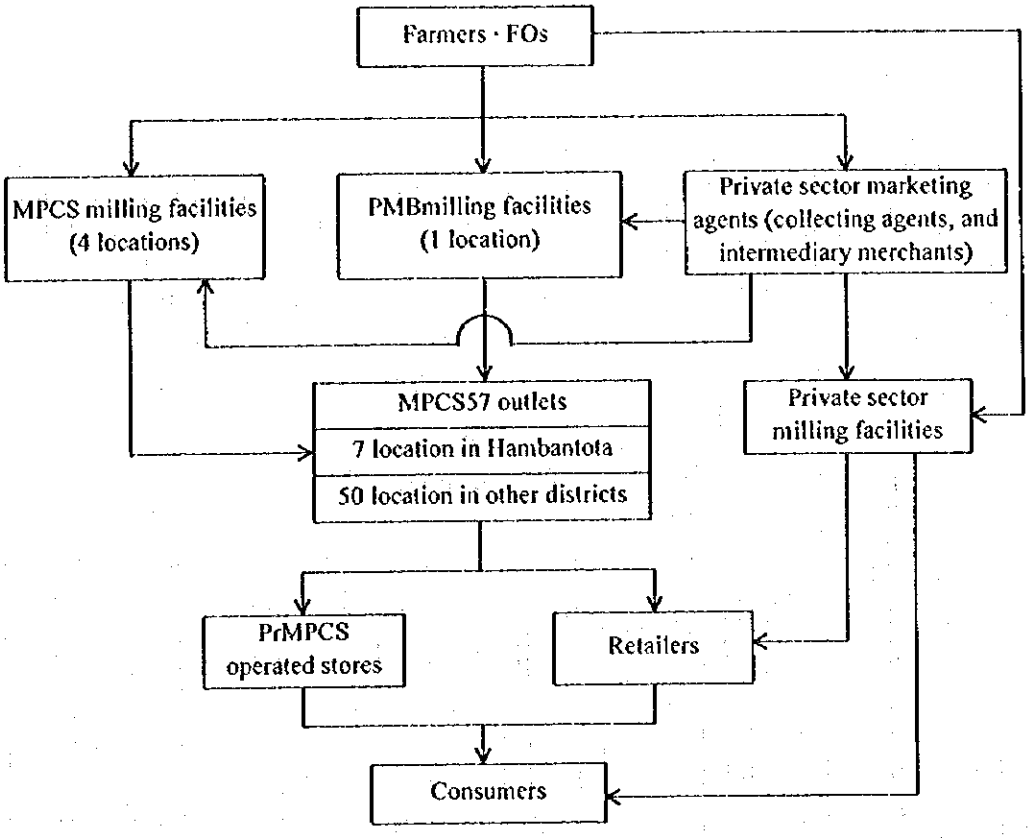
5.2.1 Marketing System for Agricultural Products and Agricultural Production Inputs

(1) Purchase and Marketing System for Agricultural Products

1) Paddy

As shown in Figure 5.2.1-1, purchase of paddy from farmers can be broadly classified into that by the public sector and that by the private sector, the former comprising the Paddy Marketing Board (PMB) and the Multi-purpose Co-operative Societies (MPCS) and the latter comprising private marketing agents. In the case of the scheme benefit areas, purchase by private marketing agents is the dominant marketing route.

Figure 5.2.1-1 Paddy Purchase and Marketing System



Activities of the paddy purchase and marketing entities are described below.

a) Paddy Marketing Board

PMB purchases paddy from the farmers, MPCS, FOs and registered private sector merchants at Rs 7.67/kg under the Guaranteed Price Scheme. This includes a transport fee commission of Rs 0.25/kg. Amount of paddy purchased by the PMB in 1995 sharply increased 5.4 fold (7,986 t) over the amount purchase in 1994.

Post harvest facilities owned by the PMB include mills and storage facilities. Three mills are located in Hambantota District (Ambalantota, Kachigala Ara, and Lungamwehera). However, the mill at Kachigala Ara is the only such facility currently in operation. The Ambalantota and Kachigala facilities are located near the Liayangastota scheme. Storage capacity at each mill is 731 t, with total capacity in the district equivalent to 2.9% (5,117 t) of the nationwide total.

Rice milled at the PMB facilities is sold to 57 MPCS outlets in the 5 districts of Hambantota, Matara, Galle, Ratnapura and Kegalle, and a small amount to the Co-operative Wholesale Establishment (CWE). Out-shipment of rice in 1995 was 17,566 t, including remilled old rice which had experienced long term storage in Hambantota and Matara districts.

b) Multi-purpose Cooperative Societies

At the Divisional Secretariat Divisions (DSD) level, there area 7 wholesale outlets, and at the Grama Niladhri Divisions (GND) 250 retail outlets. Of these, 6 wholesale outlets and 224 retail outlets are related to the agricultural activities under the 3 schemes. Paddy purchased from member farmers at Rs 8~8.50 / kg (Rs 9/kg for red rice) is processed at the MPCS milling facilities scattered through the area, after which it is marketed to the consumer via the wholesale and retail outlet network. MPCS milling facilities number five at Tissamaharama, Hambantota, Angunakolapelessa, Weeraketiya and Beliatta. In some cases, the facilities process paddy purchased by the PMB. There are 18 MPCS milling facilities in the district, with total storage capacity of 1,915 t.

c) Private Sector Marketing Agents

In conjunction with the national policy of promoting private sector participation in the rice distribution market, numerous private traders establish temporary collection points in rice production areas during the harvest season and aggressively engage in the purchase of paddy. In the case of Angunakolapelessa near the Muruthawela Reservoir scheme area, rice merchants purchase 30~50 t of paddy per day from farmers over a 1~1.5 month period. Purchase prices are Rs 8 kg for white rice and Rs 9/kg for red rice. After purchase, paddy is promptly hauled by medium class truck to private millers in Galle and Matara districts, and in Colombo. In order to secure guaranteed amounts of paddy purchase each season, marketing agents extend non-interest credit to the farmers they regularly deal with for the purchase of agricultural production inputs.

The small to medium rice millers in rural areas purchase paddy from the farmer, and after processing sell the same to retailers and directly to the consumer. Purchase price of paddy from the farmers is Rs 9/kg for white rice and Rs 10/kg for red rice. Selling price to retailers after milling is Rs 14/kg for white rice and Rs 15.50/kg for red rice.

2) Subsidiary Food Crops and Vegetables

Marketing route for subsidiary food crops in the case of the Muruthawela Reservoir and Badagiriya schemes comprises (i) purchase by the Co-operative Wholesale Establishment (CWE) and private traders, and (ii) marketing through "polas". Marketing of vegetables is primarily through the polas where large scale purchases are made by collectors and dealers.

Activities of the purchase and marketing entities for subsidiary food crops and vegetables are described below.

a) Co-operative Wholesale Establishment (CWE)

There is a CWE wholesale outlet at Dehigahalanda in Hambantota division, which purchases SFCs under the Floor Price Scheme. There are as well 7 retail outlets

(including 1 in Monaragala district), and 168 franchise outlets under the umbrella of the foregoing wholesale outlet, forming an extensive marketing network for food products.

The wholesale outlet purchases white rice from the PMB mill at Kachigala Ara, affiliated wholesale outlets in Anuradhapura and Polonnaruwa districts, and red rice from licensed private traders, and sells the same to the consumer. Retail prices are Rs 17/kg for white rice and Rs 17.50 for red rice. Crops purchased in the district are mainly green gram and cowpea. In the case of green gram, 265 t were purchased during the 3 month period January~March, with surplus being shipped to CWE supply stores in Colombo. Purchase is primarily from the farmer and licensed merchants, at prices of Rs 32/kg for green gram and Rs 24/kg for cowpea. These purchases are mostly made in Hambantota district wherein the Badagiriya scheme is located.

b) Private traders

Although farmers would like to wholesale SFCs at a better price by offsetting the shipping period, most farmers due to small farm scale are forced to wholesale their harvests as soon as possible. There is no information network to keep farmers up to date on prices prevailing outside the area, and they sell their produce at prices set by the trader.

c) Polas

Polas are scattered throughout rural and urban areas, and are open 1 or 2 times a week. In rural and urban areas they play an important role as a source for consumers of cereals, pulses, vegetables and fruits, and in turn serving as a source of cash income for farmers. They are run by the Pradeshiya Sabhas, and stall operators pay a usage fee to the Pradeshiya Sabha.

Locations of polas related to the 3 scheme areas are shown in Table 5.2.1-1.

Table 5.2.1-1 Nos. and Locations of Polas

Scheme	Division	DSD	Location
Liyangastota	Ambalantota	4	Ambalantota, Hungama, Barawakumbuka, Mamadala
	Hambantota	1	Siriyagama
Muruthawela Reservoir	Weeraketiya	4	Weeraketiya, Julampitiya, Morayaya, Meegas Ara
	Tangalle	4	Ranna, Wadugala, Netolpitiya, Vitharandeniya
	Beliatta	1	Beliatta
Badagiriya	Hambantota	1	Siriyagama

source: DSD offices

In some cases, polas are established along with wholesale markets, through which large volume purchases of local produce (banana, chili, bitter gourd, snake gourd, etc.) are made by Colombo collection agents. As the Floor Price Scheme does not apply to the vegetables sold through the polas, wholesale and retail prices for these are as shown in Table 5.2.1-2.

Table 5.2.1-2 Vegetable Wholesale · Retail Prices

Item	Wholesale price (Rs/kg)	Retail price (Rs/kg)
Chili	14~20	20~24
Dried chili		120~130
Brinjel	5~7	6~10
Long bean	10~12	15~24
Okura	7	10~12
Bitter gourd	10~12	12~16
Snake gourd	7~8	10~14

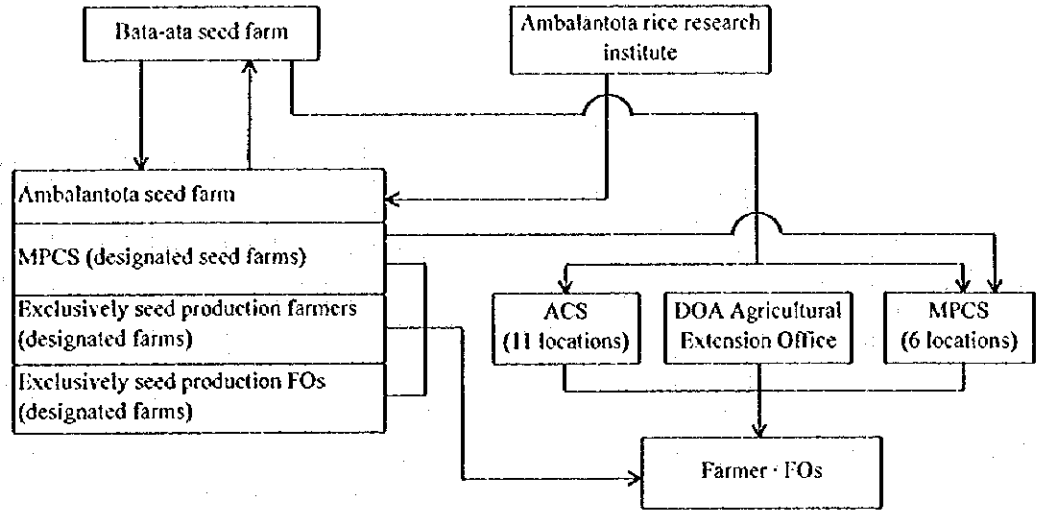
source: pola survey

(2) Marketing system for Agricultural Production Inputs

1) Seed and Planting Materials

As indicated in Figure 5.2.1-2, the paddy seed production and supply mechanism in Sri Lanka comprises seed farms directly under the Seeds and Planting Materials Department which produce seed paddy for high yielding varieties, which are then passed on to the farmer via the Agrarian Services Centres, Multi-purpose Co-operative Societies, designated seed farmers (contracted individual farmers and FOs), and Agricultural Extension Offices of the DOA. In addition, seed is purchased under high interest loan among farmers when shortages occur, or when procurement is difficult due to economic reasons. The latter is the more common in the case of poor farmers, and this type of transaction is a secondary source of income for the more wealthy farmers.

Figure 5.2.1-2 Paddy Seed Production and Marketing System



note: The benefit area of the Liyangastota scheme falls under the jurisdiction of 2 ASCs (Ambalantota, Lunama) and 1 MPCS (Hungama); that for Muruthawela Reservoir under 8 ASCs (Walasmulla, Meegas Are, Weeraketiya, Udayala, Angunakolapelessa, Netolpitiya, Beliatta, Moderawana) and 4 MPCSs (Walasmula, Weeraketiya, Tangalle, Beliatta), and that for Badagiriya under 1 ASC (Badagiriya) and 1 MPCS (Hambantota).

As can be seen from the above, the Bata-ata seed farm (paddy seed production) and Middeniya seed farm (exclusively producing SFCs and vegetable seed) are located in the district, and serve the entire Southern Province area. Activities of these farms are described below.

a) Bata-ata seed farm

In addition to improved varieties of seed paddy (foundation, registered and certified seed), Bata-ata also produces seed for subsidiary food crops and vegetables. 1995/96 Maha season production target for seed paddy is around 170 tons, of which 100 t is certified seed. Seed paddy cultivation is also contracted out to full time seed farm households and Multi-purpose Co-operative Societies. Under such contracts the seed farm extends technical guidance in registered seed paddy and cultivation and field management, while the contracted farmer or organization bears the cost for agricultural production inputs such as fertilizer and agro-chemicals. Surplus seed paddy over the contract amount can be freely marketed by the farmer or organization.

The Ambalantota seed farm is under the supervision of the Bata-ata seed farm, and in the 1994/95 Maha season produced 60 t of paddy seed. Cultivated varieties are original seed and registered seed for BW and AT varieties. Harvested seeds are delivered to the Bata-ata farm.

The Ambalantota Rice Research Station produces and distributes breeder seed to both the Bata-ata and Ambalantota seed farms. This station is under the Rice

Research and Development Institute at Batalagoda in Kurunegala district. Base seed produced are 5 types of AT variety, at amounts of around 83 kg each. Half of this is shipped and the remainder stored.

b) Middeniya seed farm

The Middeniya seed farm engages exclusively in the cultivation of seed for subsidiary food crops. Target cropped area for the 1995/96 Maha season was 22 ha. Rainfed cultivation is practiced at the farm due to lack of irrigation facilities. Specific target yields for the 1995/96 Maha season are 1,000 kg/ha for maize, 500 kg/ha for green gram, 1,000 kg/ha for black gram, and 500 kg/ha for cowpea. Following harvest, vegetable standard seeds are shipped to the Kundasala Vegetable Seeds Processing Centre in Kandy District, while SFC foundation, registered and certified seed go to Pelwehera farm in Kurunegala District.

Wholesale prices in 1996 for paddy and SFC seed are shown in Table 5.5.1-5. In the case of paddy seed sales to ASCs and MPCSs, a 10% discount rate is applied.

Paddy seed produced at the above government run seed farms is supplied to the ASCs, MPCSs and agricultural extension offices. Average retail price for the ASC and MPCS seed is Rs 12.70/kg for registered seed and 12.22/kg for certified seed. Volume of paddy seed sold by the ASCs and MPCSs in 1995 were 75.6 t and 316 t, respectively. Of the 7 MPCS outlets, those dealing in paddy seed are only the 3 at Tissamaharama, Hambantota and Hungama.

3) Fertilizer

Wholesale fertilizer supply is carried out by the Ceylon Fertilizer Company, Ltd. (CFCL), a government run wholesaler. Retailing to the farmer is handled by 6 MPCS outlets and 224 local retail stores directly under the MPCS, 11 ASCs and various licensed private merchants.

Directly under the CFCL are 3 branches at Bata-ata, Dehigahalanda and Weerawila) which supply simple fertilizers such as urea, TSP, MOP, etc. and compound fertilizers such as V-mixture, TDM and NPK. Total volume of sales in 1995 was 12,384 t, breakdown for which was 5,708 t (46.1% of the total) of V-mixture, 3,827 t (30.9%) of urea, and 2,406 t of TDM (19.4%). The bulk of this fertilizer was used for paddy cultivation.

Wholesale and retail prices (1995~96) for chemical fertilizers are shown in Table 5.2.1-3.

Table 5.2.1-3 Wholesale · Retail Prices for Chemical Fertilizer

Price	Urea	TSP	MOP	V-Mixture	TDM
Wholesale price (Rs/kg)	9.20~9.37	10.40~10.57	9.60~9.77	10.42~10.59	9.64~9.81
Retail price (Rs/kg)*	10.2	11.14	10.34	10.76	9.94

note; *average retail price for ACSs and MPCSs
source: CFCL outlets, ACSs and MPCSs in Hambantota district

Sales volumes in 1995 for chemical fertilizer by the ASCs and MPCSs are 187 t and 737 t, respectively.

3) Agro-chemicals

Insecticides, fungicides, and weedicides are primarily marketed to the farmer through the ASCs, MPCSs and licensed private traders as in the case of fertilizer.. Most of these agro-chemicals are purchased from the Ceylon Petroleum Corporation (CEYPETCO). Wholesale and retail prices for 1995~96 are shown in Table 5.2.1-4.

Table 5.2.1-4 Wholesale · Retail Prices for Agro-chemicals

Item	Volume	Wholesale price (Rs)	Retail price (Rs)
Insecticide			
Monocrotophos (60%)	400 mℓ	243.24	270.00
Ceyphos	400 mℓ	295.50	328.00
Weedicide			
3-4 DPAD (36%)	400 mℓ	105.41	117.00
	3 ℓ	664.86	738.00
MCPA (40%)	400 mℓ	76.58	85.00
	3 ℓ	448.65	498.00
MCPA (60%)	400 mℓ	111.71	124.00
	3 ℓ	713.51	792.00

source: CEYPETCO price schedules, ASCs, MPCSs

4) Agricultural equipment and machinery

Reflecting the steady advancement of agricultural mechanization in the country, 2-wheel and 4-wheel tractors are leased to farmers through the ASCs, MPCSs and farmer organizations. 4-wheel tractors are deployed at each branch of the MPCSs and are rented to member farmers for Rs 1,300 per day, and farmers bear the cost for fuel. In addition to rental of 4 wheel tractors to member farmers, the ASCs extend credit to FOs for the purchase of tractors. In addition to farm use during the

cropping season, tractors also serves as an important means of travel and transport in rural areas.

On the basis of analysis of the above marketing system for agricultural products and agricultural production inputs, it is concluded that the present system is adequate to support increased demand for inputs and increased agricultural production as a result of implementation of the Project. For example, the increase in fertilizer consumption under the 3 schemes with the Project is estimated at around 3,700 t per year, which is only 29% of the total sales in the district by the CFCL in 1995.

5.2.2 Rural Credit

Under the New Comprehensive Rural Credit Scheme aimed at increasing agricultural productivity, cultivation loans (money for purchase of main farm inputs including seed, fertilizer, agro-chemicals, etc.) for paddy and subsidiary food crops are available from 7 banks both national and private. Interest rate is 16% p.a., with a maximum repayment period of 8 months.

This extension of credit is limited to landholder and tenant farmers who have shown good cultivation achievement for 3 years running. Credit conditions are 2 guarantors (with proof of income) and a crop insurance policy.

The Agricultural Insurance Board, an external body to the Ministry of Agriculture, Land and Forestry, is the agency which oversees crop insurance. Of the 3 schemes, crop insurance policy holding rate is highest for Muruthawela Reservoir at 82.4 per cent of the beneficiary farmers, while that for Badagiriya is lowest at 47.6%. The reason for not holding such policy in the case of 42~53% of the farmers is delays in compensation payments. In addition to this in the case of 56~70% of the farmers is the complex procedure in taking out the crop insurance policy.

Cultivation loans over the past 3 years were most in the Liyangastota scheme area (67.4% of the farmers) followed by the Badagiriya scheme (52.4% of the farmers) and the Muruthawela Reservoir scheme (45.0%) of the farmers. These loans are extended mainly by the Regional Rural Development Bank and the Bank of Ceylon, and interest rates are high in the case of all the schemes at 68~76%. The main problem in the case of these loans is a dropping recovery rate, with average recovery rate for the Bank of Ceylon at around 78.8%.

In addition to the above national and private banks, credit is also extended by the ASCs with jurisdiction over the benefit areas, and by private money lenders. In the case of the ASCs, credit is available to members at an interest rate of 10% per 6 months, with a maximum loan ceiling of Rs 8,000 / ac and repayment period of 6 months. Qualification criteria for credit are essential the same as for the banks, i.e., ① the party applying for credit must be a landholder or tenant farmer, ② his land must be registered with the center, ③ he possesses an Agricultural ID card, ④ he has a crop insurance policy, etc. The applicant is required to have 2 guarantors, and the loan

contract is signed between the recipient and the Agrarian Services Committee in accordance with stipulations of the Agrarian Services Act. This committee comprises 15 members, i.e. 10 FO leaders, 1 AI, 1 staff of the ASC, 1 minor export crop specialist, 1 animal husbandry specialist, and 1 coconut cultivation specialist. The Department of Agrarian Services which oversees the ASCs is concerned as well about the dropping loan recovery rate and there are a number of cases where the DAS has resorted to court arbitration (in accordance with the Agrarian Services Act) where default on loans has occurred. In the case of the 3 scheme areas, low rate of farmer participation in the ASC loan program is significant, being only a 2~3% use rate compared with other credit agencies.

In the above manner, despite active credit activities by national banks and other credit institutions, bank transactions have been mainly limited to the very small number of medium to large farmers who meet the loan conditions and hold collateral. The many small farmers who cannot meet the strict criteria for bank loans are thereby forced to rely on private financing which require repayment at a high rate of interest at 50~100% per six months. Dependency of private credit is highest in the Badagiriya scheme area at 57.1%, and lowest in the Liyangastota scheme area at 34.9%. Sources of such private loans are mainly friends, relatives, private merchants, and local money lenders. In each scheme area, rate of such borrowing reaches 71~85%. Almost all the farmers relying on such private credit have been refused loans by the national and private banks, the principal reason being conflicts with loan officers over credit conditions, or poor performance in the past in repaying loans. In order to alleviate this dependence on the part of farmers on high interest financing and improve the function of the credit system of existing national and private banks, it is considered necessary to (i) establish "softer" credit extension conditions such as preferential interest rates, extension of loan repayment grace periods, etc. depending on farm household type and farm scale, and (ii) expand the scope of eligible recipients of farm credit to include not only individual farmers but farmer organizations as well in order to enable shared responsibility and shared risk for loan repayment obligations.

The DAS cites the inadequacies of the present agricultural credit operations as due to lack of active engagement in credit extension to small farmers by the national banks, and delayed settlement of debts. To address this problem, the agency is studying the possible establishment of a Govi Jana Bank along the lines of the Gramin Bank system in Bangladesh. In contrast to the national and private banks, this institution would not carry on credit extension activities on a commercial base, but rather focus on service to the farmer, particular the small farmer.

In addition to cultivation loans, there are various credit programs in for the agricultural and rural sector, including a self help entrepreneurial development plan, agricultural machinery and agricultural production input supply plan, perennial crop production plan, livestock and dairy development plan, joint fisheries development plan, small~medium enterprise development plan, etc.

5.3 Irrigation and Drainage

5.3.1 Benefit Area of the Schemes

The Study Team carried out toposurvey (S = 1/5,000) during the latter part of the Phase I study (June~October 1995) for the 3 schemes ultimately selected for feasibility study. Subsequent to that, the Team field surveyed the existing irrigation and drainage systems during the Phase II study (January~April 1996) on the basis of the said topomapping. Confirmation of the status of the 3 schemes was done with the collaboration of the relevant Irrigation Department office and representatives of the 129 FOs and other farmers. The said confirmation survey required 1 month. Eventually, some 1,500 farmers participated in the survey.

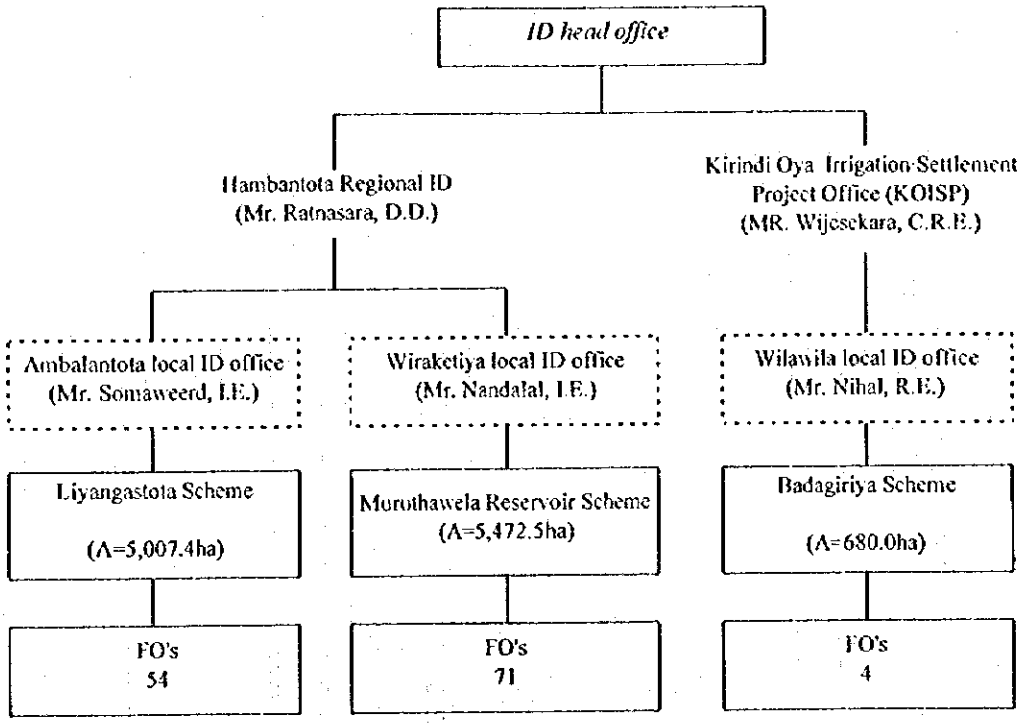
On the basis of the findings from the above survey, the Team gauged the size of benefit areas by planimeter. Calculated benefit areas were subsequently agreed to as the design benefit areas under the Project in discussions between the Team and the Hambantota Irrigation Department office (March 1996).

Design benefit areas and canal length breakdowns so agreed to are indicated below.

Scheme	Sub-scheme	Area(ha)	Canal length			
			Intake canal	Main canal	Branch canal	D-canal
Liyangastota	Ambalantota	2,454.0		26,300		43,750
	Hambantota	2,553.4	6,475	12,203	34,900	30,884
Total		5,007.4	6,475	38,503	34,900	74,634
Muruthawela	Left Bank	1,700.1		14,443		33,980
Reservoir	Urubokka Oya	2,261.9				65,700
	Kirama Oya	1,510.5				65,500
Total		5,472.5		14,443		165,180
Badagiriya	-					
Total		686.0	7,600	8,604		31,853
Grand Total		11,165.9	14,075	61,550	34,900	271,667

5.3.2 Irrigation Department Organization for the Project Area

The target 3 schemes are managed by the ID under the following organizational set-up. A total of 129 FOs for all 3 scheme areas were identified during the Study.



5.3.3 Liyangastota Scheme

(1) Location and Basin Conditions

This scheme is located 15 km west of Hambantota, at the mouth of the Walawe River. Uda Walawe Reservoir (completed in 1968; storage = 240 million m^3) and Samanalawewa Reservoir (completed in 1993; storage = 218 million m^3) have been constructed in the upper basin, and the basin itself forms a complex water balance condition. A feasibility study for left bank irrigation development at Uda Walawe scheme was carried out in 1992 by JICA, and funding for implementation of the same is expected under assistance by OECF.

Liyangastota anicut (completed in 1889; 21.5 km from the river mouth) is located on the Walawe Ganga and irrigates areas along the both banks. Ridiyagama Reservoir was subsequently constructed in 1927 on the left bank, connected to the Walawe River by a Feeder Canal, and provides irrigation water to the left bank. Area serviced from the said Ridiyagama reservoir is referred to as the Walawe Left Bank Scheme, and that area irrigated by direct diversion from the Liyangastota anicut to the right bank is called the Walawe Right Bank Scheme. Irrigation facilities within the scheme area have as yet not been the subject of a rehabilitation project.

(2) Benefit Area and Component Units

Present total benefit area for both the right and left bank sub-schemes is 5,000 ha. The right bank scheme (Walawe RB) comprises 3 units and the left bank scheme (Walawe LB) comprises 2 units.

Sub-scheme	Unit	Benefit area (ha)
Walawe RB (WRB)	Mamadala	855
	Oluwila	805
	Lunama	794
Total		2,454
Walawe LB (WLB)	Ridiyagama	759
	Bolana	1,794
Total		2,553
Liyangastota Grand total	5 units	5,007

(3) Canal Length under the Liyangastota Scheme

Sub-scheme	Main Canal	Branch canal length	D-canal length	Total
Walawe RB	26,300	-	43,750	70,050
Walawe LB	12,203	34,900	30,884	77,987
Total	38,503	34,900	74,634	148,037

Total canal length under the scheme for D-canal and above is 148.037 km (at the time of the Master Plan this was calculated at 152.2 km. Canal length under this Feasibility Study was computed based on field survey and applying the topomapping (S = 1/5,000) prepared during the Phase II survey period.

(4) Overall System Diagram

An overall system diagram of the Liyangastota Scheme is indicated in Figure 5.3.3-1.

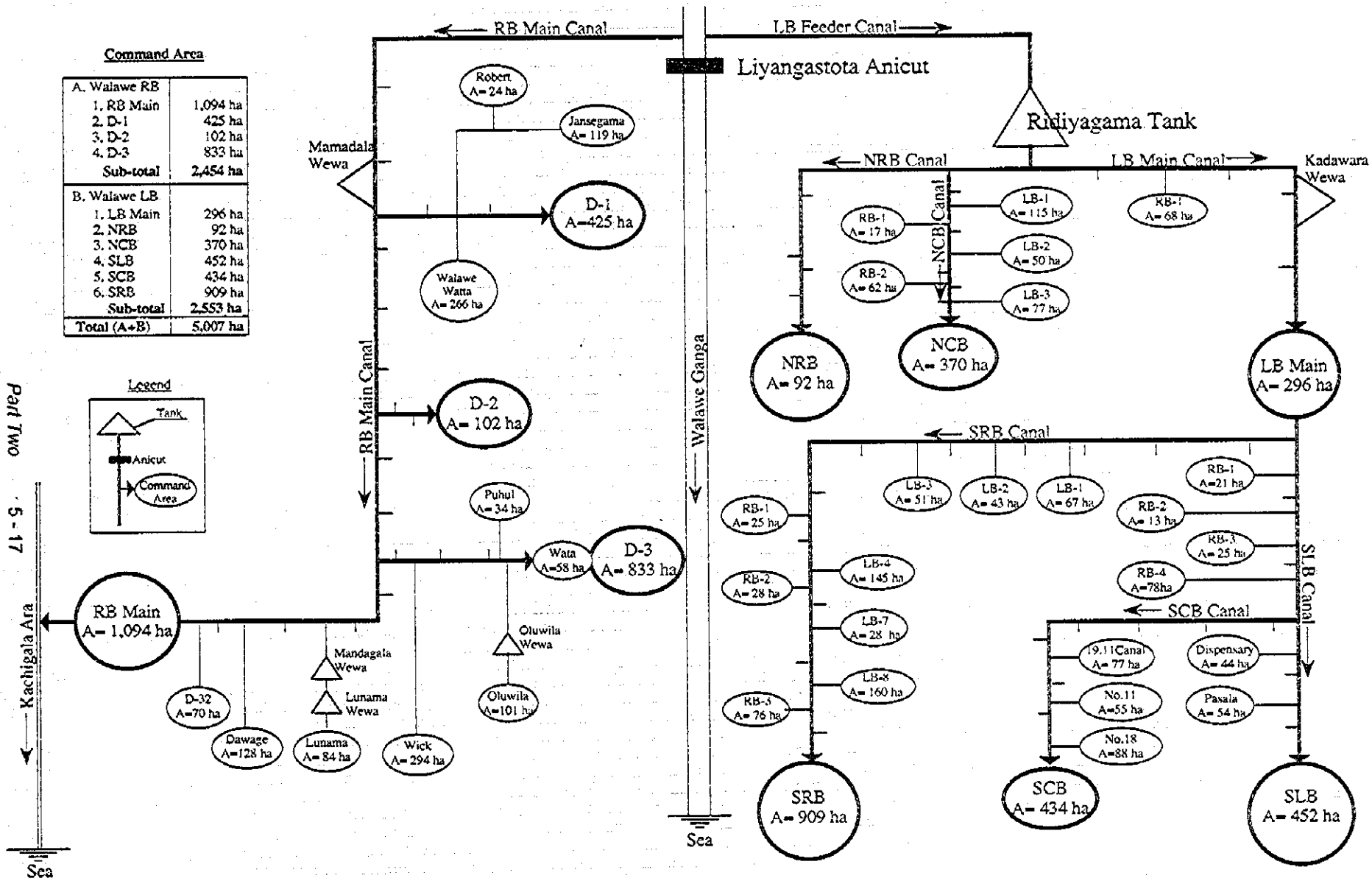


Figure 5.3.3-1 Overall System Diagram of Liyangastota Scheme **(for F/S Study)**

(5) Description of Scheme Facilities

1) Year of Construction

Year of construction, and number of years which have elapsed since construction are indicated below.

Facility	Year of construction	No. of years since construction
Liyangastota anicut	1,889	107
Feeder Canal	1925~27	68
Ridiyagama tank	1925~27	69
WLB canal system	1,928	68
WRB canal system	1,927	69

2) Original Design Features of Main Facilities

<Liyangastota anicut>

Liyangastota anicut was constructed in 1889. The Irrigation Department was established in 1919, since which time it has managed the Liyangastota scheme facilities.

The weir has 16 fixed bays (stoplogs), 2 movable bays and 4 spillway gates. Crest length is 70 m. The anicut is the oldest irrigation facility in the Walawe Ganga basin.

The anicut, with its 16 nos. of fixed bays (timber planked), at present still maintains its diversion function.

Pier bodies are constructed of masonry concrete, and visual inspection indicates no obvious damage; however, leakage from stoplog channels is observed in places. Sedimentation at the upstream side of the anicut has reached the crest level of the stoplogs, and as a result, the sand flushway does not function causing sediment influx in the main canals on both banks. Rock is exposed at both the upstream and downstream sides of the structure. It is considered appropriate that this anicut be the fixed type.

As a result of the above survey, design features for the weir are as follows.

Salient Features of Liyangastota Anicut

Facility	Salient design features	Design value
Liyangastota anicut	(original design)	
	Catchment area	2,260 km²
	Mean annual rainfall	1,340 mm
	Mean annual discharge	2,200 MCM
	Design flood level (HFL)	24.570 m (MSL)
	Desing intake level (HSL)	20.570m
	No. of stoplog gates	16 gates (W 1.753 m × H 3.505 m)
	Stoplog gate crest	17,432 m
	Sand flush gate	4 gates (W 1.219 m × H 1.524 m ~ 2.744 m)
	Movable bay gates	2 gates (W 1.83 m × H 3.35 m)
	Crest length	
Intake gate	(original design)	
(WLB)	Design intake level	20.570 m (MSL)
	Design discharge	8.12 m³/s
	Gate sill height	17.689 m
	No. of gates	4 gates (W 1.976 m × H 1.604 m)
(WRB)	Design intake level	20.570 m (MSL)
	Design discharge	7.77 m³/s
	Gate sill height	18.647 m
	No. of gates	2 gates (W 1.52 m × H2.128 m)

<Feeder Canal and Ridiyagama Reservoir>

The feeder canal was built at the same time as Ridiyagama reservoir, and for is unlined for its entire length. Profile and cross-section require rehabilitation due to damage from sediment inflow at the anicut, and damage caused by water buffalo from the adjacent Agricultural Department farm. There is no discharge gauging facility at the start point of the canal, and as a result discharge regulation is performed by ID engineers empirically based on the water level of Ridiyagama reservoir downstream. Feeder canal length is 6.6 km to Ridiyagama reservoir.

The Ridiyagama reservoir is the water source for the Walawe LB sub-scheme (A = 2,553.4 ha). Dam type is earthen, and although there are no official records on dam height, cross-sectional survey implies a low dam of under 15 m height. Crest enbankment length is 2.2 km, with a bund top width of 3.0 m. Records indicated construction in 1927. The upstream face of the dam body is currently being reinforced with riprap by the ID. Slope collapse and toe seepage continue to progress on the downstream face of the dam, requiring urgent embankment widening. Survey of seepage amount from the downstream side embankment toe was commenced in 1990~91 by the ID, however, data as yet has not been collated.

Salient features of the Walawe LB feeder canal and Ridiyagama reservoir are as follows.

Salient Features of Walawe LB Feeder Canal and Ridiyagama Reservoir

Facility	Salient design features	Design value
Feeder Canal	(original design)	
	Length of Canal	6.57 km
	Present Bed Width	3 to 15 m (according to field survey)
	Bed Level at the Inlet	18.39 m MSL
	Observed Values at the Beginning Point of Canal on Feb. 1995 are;	
	- Bed Width	3.0 m
	- Canal slope gradient	1:1
	- Canal bed gradient	0.0004 (1/2,500)
	- Coefficient of Roughness	n = 0.04
	- Water depth	d = 2.0 m
	- Converted discharge by Manning Formula	Q ≈ 7.2m³/s
Ridiyagama Reservoir	(original design)	
	<Reservoir>	
	Catchment Area	28.5 km²
	Capacity (effective)	26 MCM
	Dead Storage	1.97 MCM
	Bund Top Level	20.920 m MSL
	H.F.L	20.006 m
	Free Board	0.914 m
	F.S.L	18.850 m
	Bund Top Width	3.0 m
	Length	2195 m
	Sid :	1 : 2.0 upstream; 1 : 3.0 downstream
	<Intake>	
	No. of Sluices	one
	Opening	1.219 m (W) x 1.060 m (H) 2 Nos.
	Sill Level	13.78 m
	Outlet culvert	ø 2.5 m, L ≈ 40 m (according to field survey)
	<Spills>	
	No. of Spills	Two
	Length (main)	46.5 m, Crest Level 18.95m MSL
	Length (auxiliary)	92.1 m, Crest Level 19.10m MSL

5.3.3.1 Walawe RB Sub-scheme

(1) Irrigation System

1) Unit-wise irrigated area and canal-wise command area

The WRB scheme comprises 3 units with a total benefit area of 2,454 ha. Area directly irrigated from the main canal is 812.4 ha (33%), and that from directly from the D-canals is 1,641.6 ha (67%).

Unit-wise Irrigated Area and Canal-wise Command Area

Unit	Irrigated area (ha)	Canal-wise command area (ha)		
		Direct from main canal	From D-canal	Command canal
Mamadala	826.9	300.2	526.7	D-1, D-2
Oluwila	832.9		832.9	D-3
Lunama	794.2	512.2	282.0	Lunama, Dawage D-32
Total	2,454.0 (100%)	812.4 (33%)	1,641.6 (67%)	

2) Water level regulating facilities for RB main canal

Water level regulating facilities are located at the following 2 sites along the 26.3 km long main canal.

① Canal start point (STA 0 + 000: Liyangastota anicut intake gate)

② At the 18 km point downstream along the canal (STA18 + 005)

Of special note is the fact that no diversion occurs from the canal for its first 10 km of length.

3) D-canal (branch canals) length and density

Unit-wise D-canal length and command area breakdowns are shown below.

Average D-canal density is 26.7 m/ha.

Unit-wise D-Canal Length, Command Area Breakdowns and Canal Density

D-canal	Length (m)	Command area (ha)	Canal density (m/ha)
<Mamadala>			
D - 1	900	16.1	
Walawe Watta	3,000	265.5	
Jansegama	2,650	119.2	
Robert	1,250	24.1	
D - 2	1,600	101.8	average:
Sub-total	9,400\ m	526.7 ha	17.8 m/ha
<Oluwila>			
D - 3	7,500	245.6	
Wickramanayaka	5,650	323.1	
D - 4	3,200	71.2	
Puhul Yaya	1,250	34.0	
Oluwila	3,500	101.4	
Wata Ela	1,750	57.6	average:
Sub-total	22,850\ m	832.9 ha	27.4 m/ha
<Lunama>			
Lunama	2,800	84.2	
Dawage	6,000	127.6	
D - 32	2,700	70.2	average:
Sub-total	11,500	282.0	40.8 m/ha
Total	43,750\ m	1,641.6 ha	26.7 m/ha

4) Tanks

Tanks are located in the scheme are at 5 locations.

The 2 tanks on the right bank of the main canal capture excess irrigation runoff from upstream (Udawalawe area)

Overall, the tanks are not maintained, and sediment buildup and vegetal growth are serious. Water depth is shallow (1~2 m), and their are no available records on storage water levels nor storage capacities. Storage water level drops significantly during the Yala season, at which time the tanks lose their storage function.

Tank location	No.	Name (command canal)
Main canal right bank	2	Mamadala Wewa (total area)
		Mahadeniya Wawa (part of Lunama unit)
Oluwila unit	1	Oluwila Wewa (Oluwila RB, LB)
Lunama unit	2	Mandagala Wewa (Lunama D-canal)
		Lunama Wewa (Lunama D-canal)

5) Major drainage canals

There are 7 major drainage canals in the area. The 3 drainage canals at the upstream segment of the main canal, and the drainage canals at 1 location each in the Mamadala unit (at Beminivanwila) and the Oluwila unit (total of 5 canals) drain into the Walawe Ganga. The 2 drainage canals in the Lunama unit empty into the Kachigala oya. A characteristic of the WRB scheme drainage system is that in the case of the entire main canal length of 26.3 km, a portion of the run-off from the right bank upstream basin is converted to irrigation discharge.

6) Present drainage system

A diagram of the present drainage system is shown in Figure 5.3.3.1-1.

The diagram was prepared on the basis of field survey, applying 1/5000 scale topomapping.

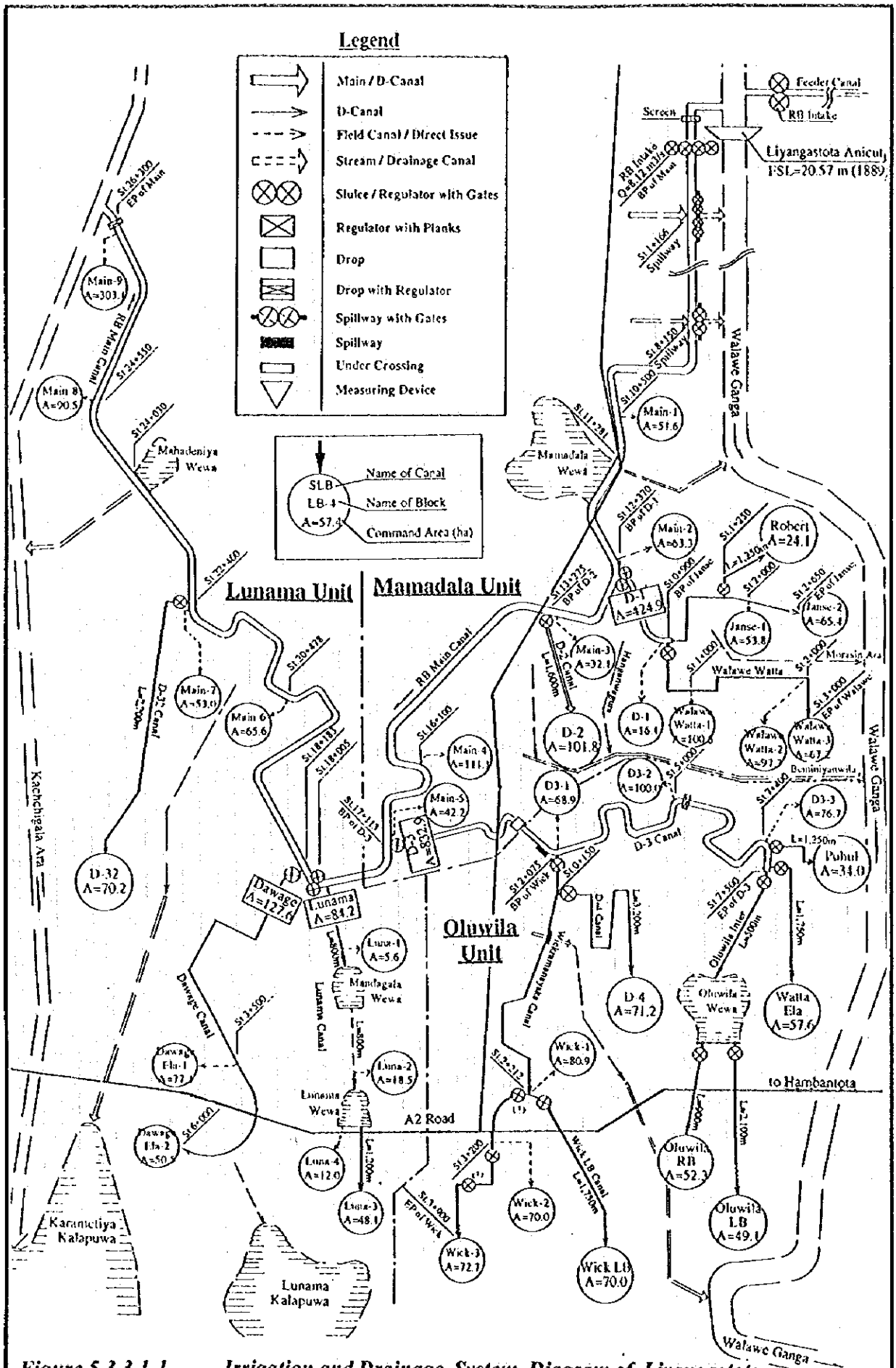
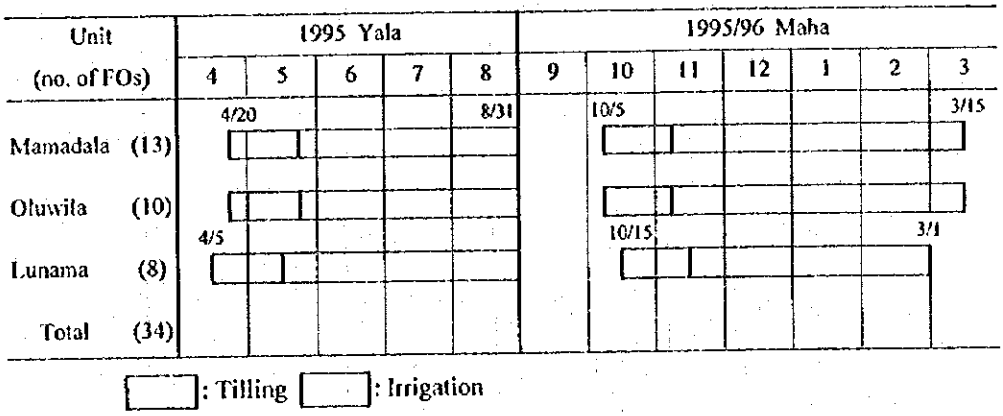


Figure 5.3.3.1-1 ***Irrigation and Drainage System Diagram of Liyangastota WRB Scheme***

(2) Irrigation Period for Walawe RB Scheme

Representative irrigation period is indicated below for this scheme. It is based on the results of interview survey of 31 FOs. The period comprises 30 days of tilling and 100~105 days of irrigation.

The longer irrigation period during the Yala season in the Lunama unit is due to the fact that the scheme is at the downstream terminus of the main canal and suffers from water shortage due to excess diversion at the upper reaches of the canal.



(3) Present Water Balance

The WRB sub-scheme draws water from the Liyangastota right bank anicut on the Walawe Ganga for irrigation of the entire scheme area of 2,454 ha. In the case of this sub-scheme area, land development has progressed to a level where creation of new irrigated farm land is not considered possible, and under the with-project scenario as well, irrigated area is assumed at the present 2,454 ha.

Shown below are the results of water analysis for 19 cases over the last 9 years carried out during the Phase I study (1985/86 Yala ~ 1994/95 Yala). From the same, it is concluded that the WRB scheme has ample water resources. The water shortage appearing in a part of the area is attributed to seepage from deteriorated facilities, inadequate structure cross-sections and over-diversion at the upstream portion of the scheme. (The irrigable area and irrigation rate indicated in the table below represent values computed on the basis of a target irrigated area of 2,454 ha and do not imply any expansion of irrigated area.)

Results of Current Water Balance Computations for WRB Scheme

Year		① Potential diversion from Liyangastota anicut (1,000m³)	② Discharge possible for irrigation (① × 50%) (1,000m³)	③FWR (mm)	④Irrigable area (ha)	Irrigation rate (%) ④ / 2,454 ha
1985/86	Yala	155,180	77,590	1,323	6,006	245
1986/87	Maha	186,162	93,081	1,096	8,762	357
	Yala	144,208	72,104	1,323	5,823	237
1987/88	Maha	186,031	93,015	1,047	9,365	382
	Yala	267,300	133,650	1,363	10,256	418
1988/89	Maha	163,495	81,748	1,095	8,222	335
	Yala	171,223	85,612	1,266	6,998	285
1989/90	Maha	172,068	86,034	1,095	8,013	327
	Yala	182,644	91,322	1,266	7,406	302
1990/91	Maha	199,144	99,572	1,165	9,609	392
	Yala	132,400	66,200	1,266	5,844	238
1991/92	Maha	188,942	94,471	1,165	8,865	361
	Yala	187,325	93,663	1,266	7,605	310
1992/93	Maha	132,367	66,183	1,096	6,604	269
	Yala	128,368	64,184	1,323	5,247	214
1993/94	Maha	156,674	78,337	1,095	8,130	331
	Yala	110,139	55,069	1,266	4,585	187
1994/95	Maha	197,715	98,858	1,165	9,378	382
	Yala	268,527	134,268	1,266	10,954	446

note: Water balance calculation is according to the following criteria:

Potential diversion from Liyangastota:	computed on the basis of the possible diversion discharge at the intake weir as used in Phase I (Master Plan study), and reflecting the irrigation discharge utilized under the WLB scheme.
Potential irrigation discharge:	current irrigation efficiency assumed at 50%.
FWR (field water requirement):	adopts the actual irrigation period as identified under the Phase II study.

(4) Assessment of Present Irrigation / Drainage System under the WRB Sub-scheme

1) Water source

On the basis of present water balance calculation, water resource are considered adequate and stable for both the Yala and Maha seasons.

2) Water level regulating facilities

As there is no discharge regulating facility at the intake point at Liyangastota anicut, there is no overall discharge control in effect under the WRB sub-scheme. A new gauging facility would accordingly be constructed under the Project. Also, the lack of water level regulating gates on the main canal make it impossible to effectively allocate discharge to the branch canals.

It is thus necessary to integrate the canal system by establishing water level regulating gates at 6 locations on the main canal and gauging facilities (parshall flume) at 10 locations.

Locations for setting the above facilities are as follows:

Unit	Main canal water level regulating gate		Gauging facility (parshall flume)	
	Location	Branch canal	Location	Site
Mamadala	STA12+370	D - 1	Main canal STA12+370	Directly upstream of D-1 canal
			Branch canal STA0+900	Directly upstream of Walawe Wewa D-canal
	STA13+275	D - 2	(same as left)	Directly upstream of D-2 canal
Oluwila	STA17+113	D - 3	(same as left)	Directly upstream of D-3 canal
			Branch canal STA2+075	Directly upstream of Wicramanayaka D-canal
			Branch canal STA7+500	Directly upstream of Oluwila tank command canal
Lunama	STA18+005	Lunama D-canal	(same as left)	Directly upstream of Lunama D-canal
	STA20+478	Main - 6 block	(same as left)	Directly upstream of new canal in Main-6 block
	STA22+460	D-32 and downstream M - 8/9 blocks	(same as left)	Directly upstream of D-32 canal
			(same as left)	Farmland downstream of STA22 + 460 (main canal location)
	Total	6 sites	Total	10 sites

3) Rehabilitation of tank regulating gates

The regulating gates at 2 tanks on the left bank of the main drainage canal will be rehabilitated, and thereby allowing control of runoff from upstream which can effectively be reused as irrigation discharge downstream.

Locations of these are as follows:

Mamadala Wewa	(tank)	:	main canal STA11 + 500
Mahadeniya Wewa	(tank)	:	main canal STA24 + 030

4) Water carrying capacity of irrigation canal cross-section

The Study Team carried out the longitudinal and cross sectional canal surveys for the WRB sub-scheme during Phase I study.

Canals surveyed were the entire main canal, D-3 canals and Wicramanayaka canal. On the basis of this and field survey, the following rehabilitation in the area was concluded to be necessary.

(Segments requiring review of adequacy of conveyance cross-section)

This comprises the entire length of main canal, and D-canals in the Oluwila unit with breakdown as follows:

- Entire 26.3 km segment of main canal STA0~ STA26 + 300 (EP)
- Total length of 2.2 km of Wickramanayaka D-canal

(Segments requiring rehabilitation)

This comprises the entire 43.7 km total length of D-canals in the 3 units with breakdown as follows:

- Total length of 9.4 km of D-canal in Mamadala unit
- Total length of 22.8 km of D-canal in Oluwila unit (including Wickramanayaka canal)
- Total length of 11.5 km of D-canal in Mamadala unit

(D-canal segments to be newly constructed)

- 2.5 km of new canal from the Main-6 turnout at STA20 + 070 on the Lunama unit main canal (benefit area: 65.6 ha)

Construction of this new canal will promote FO managed irrigation for Lunama Ela where organization of farmers to date has lagged.

5.3.3.2 Walawe LB Sub-scheme

(1) Irrigation / Drainage System

1) Unit wise irrigated area, and canal-wise command area

The total benefit area of the WLB sub-scheme of 2,533 ha is comprised of the 2 units below.

Canal network in the upstream Ridiyagama unit comprises 1 main canal (LB main), 2 branch canals (NCB, NRB canals) and 10 D-canals. The canal network in the downstream Bolana unit comprises 3 branch canals (SLB, SCB, SRB canals), and 2 D-canals. The entire area is irrigated by this canal system, and command areas by type of canal are indicated below.

Unit Wise Irrigated Area, and Canal-wise Command Area

Unit	Irrigated area (ha)	Breakdown of canal command area (unit: ha)			
		Main canal direct diversion	Branch canal direct diversion	D-canal diversion	Bund raising of drainage canal
Ridiyagama	758.4	227.9	141.9	388.6	--
Bolana	1,795.0	--	647.6	1,078.10	69.3
Total	2533.4	227.9	789.5	1,466.70	69.3
	(100%)	(9%)	(31%)	(57%)	(3%)

2) Major turnout facilities

Major turnout facilities are located at the following 5 locations. Of these facilities, the a) intake tower and b) inlet pipe are in good condition. However, c), d), and e) facilities are non-functioning due to deterioration.

a) Irrigation discharge in the area is regulated by adjusting the opening of the intake tower sluice gate at the Ridiyagama tank. Regulated discharge flows via an inlet pipe (ø 2.5 m) in the embankment to the feeder canal and then into the main canal (LB main)

b) Discharge then immediately splits to both the right bank (NRB canal) and downstream (LB main). The discharge diverted to the right bank side irrigates 60% of the Ridiyagama unit (NRB + NCB benefit area: 460 ha).

c) Discharge diverted to the downstream side irrigates the remaining 40% of the Ridiyagama unit and the entire downstream Bolana unit area (total: 2,073 ha) equivalent to 82% of the entire WLB scheme.

d) Discharged diverted downstream is conveyed by the LB main canal (total length: 12 km). At STA12 + 003 on the LB main canal, discharge is split to both the right and left banks of the Bolana unit. Command area for right bank diversion (SRB canal) is 909 ha, and that for left bank diversion (SLB + SCB canals) is 886 ha.

e) The split point for the SCB is at the 4 km point along the SLB branch canal. Irrigated area at this point is 434 ha.

3) Interval for turnouts on D-canals and turnout structure

There are turnouts and water level regulating facilities at a total of 51 locations in the sub-scheme area. Of these, 29 turnouts are located immediately after branch canal split into D canal (start point of D-canal). The remaining 22 locations of turnout are along D-canal, or comprise water level regulating gates. Of the total 51 facilities, 19 (37%) are stoplog structures, and the remaining 67% are of the gate type.

Interval for turnouts along D-canals varies by canal; however, the average is 1 site every 1.2 km. Command canal length per turnout is around 1.2 km. Field survey indicated the deterioration of these facilities, and interview with farmers showed a strong desire that these be given priority for rehabilitation over the canals. (Refer to the D-canal turnout location table on the following page.)

D-Canal Turnout Locations under the WLB Sub-scheme

Canal name		Turnout facility location		No. of gates at start point		Gates on branch canal		Gate no. total		Branch canal length (m)
Main - branch canal name	D-canal	Location (STA)	Interval distance (m)	Stoplog	Gate	Stoplog	Gate			
LB Main		0	0							
	RB -1	1+840	1,840		1			1		1,100
NRB										
					1	3	2	6		4,500
					(1)	(3)	(2)	(6)	Average	750
NCB		0+000	0		1	3	2	6		3,200
	LB -1	0+920	920	1				1		2,000
	RB -1	1+295	375		1			1		600
	LB -2	1+822	527		1			1		1,000
	RB -2	1+965	143		1			1		2,000
	LB -3	2+344	379	1				1		1,100
	Sub-total		Average 459	(2)	(4)	(3)	(2)	(11)	Average	990
SLB		0+000	0		1	4		5		15,800
	RB -1	0+491	491		1			1		300
	RB -2	1+611	1,120		1			1		500
	RB -3	2+853	1,242		1			1		400
	RB -4	3+782	929		1	1		2		1,500
	Dispencer	5+800	2,018		1			1		1,300
	Pansala	14+900	9,100		1			1		1,300
	Sub-total		Average 2,483		(7)	(5)		(12)	Average	1,758
SCB		0+000	0		1	3		4		3,800
	19.41canal	0+556	556		1			1		500
	No.11 Ela	1+228	732		1			1		800
	No.11 Ela	2+216	988		1			1		1,500
	Sub-total		Average 756		(4)	(3)		(7)	Average	942
SLB		0+000	0		1	3	1	5		7,600
	LB -1	0+178	178		1			1		1,700
	LB -2	0+456	278		1			1		700
	LB -3	1+746	1,290		1			1		1,400
	RB -1	2+195	449		1			1		1,100
	LB -4	2+799	604		1			1		4,300
	RB -2	3+000	201		1			1		800
	LB -7	4+800	1,800		1			1		500
	LB -8	5+150	350		1			1		3,200
	RB -3	5+450	300		1			1		2,500
	Sub-total		Average 650		(10)	(3)	(1)	(14)	Average	1,685
	Overall total		Overall average 1,230	2	27	17	5	51	Overall average	1,204

4) Branch canal and D-canal length, and canal density

Canal length in the area is shown below; overall canal density is 30.5 m/ha.

Branch Canal and D-canal Length, and Canal Density

Main canal branch canal name		Canal length (m) Main canal	Branch canal	D-canal	Total	Irrigated area (ha)	Canal density (m/ha)
Ridiyagama unit							
LB Main		12,203				296.3	
NRB			4,500			92.2	
NCB			3,200	6,700		369.9	
	Sub-total	12,203	7,700	6,700	26,603	758.4	35.1
Bolana unit							
SLB			15,800	5,300		451.9	
SCB			3,800	2,800		433.7	
SRB			7,600	16,084		909.4	
	Sub-total		27,200	24,184	51,384	1,795.0	28.6
Total		12,203	34,900	30,884	77,987	2553.4	30.5

5) Drainage facilities and network

<Ridiyagama unit>

There are 2 main drainage canals in the area which drain into the Walawe Ganga.

Of these, the Kogalla Ara drainage canal is the canal into which discharge originating from the LB main canal drains. The drainage canals are unlined, and maintenance is poor with sediment buildup and vegetation growth in the canals. However, there is sufficient elevation difference with the Walawe Ganga to prevent the effects of backwater. A portion of these canals function as both drainage and irrigation canal.

<Bolana unit>

There are 3 main drainage canals in the area which drain into the Walawe Ganga.

Two anicuts (Karagas and Paibokka) are located at the downstream of the Karagaha Ara and Baragama Ara drainage canals, and function to divert discharge for irrigation. Drainage canals are unlined, and like in the case of the Ridiyagama unit, maintenance is poor.

<Drainage from outside the area>

On the left bank of both the LB main canal of the Ridiyagama unit (12 km length) and the SLB canal (15 km length) of the Bolana unit, there are a total of 8 locations of drainage structures to handle runoff flowing in from outside the area. During the Maha season, this runoff is channeled into the main and branch drainage canals via

drainage gates. However, the deteriorated state of these facilities (inflow works and drainage gates) makes them impossible to be operated.

6) Present irrigation / drainage canal system diagram

The present irrigation / drainage canal system is diagrammed in Figure 5.3.3.2-1.

The diagram was prepared from the results of field survey, based on S = 1/5,000 scale topomapping.

(2) WLB Scheme Irrigation Period

Interview with all 24 FOs in the area during field survey and Ridiyagama tank discharge record for 1985~86 indicate an irrigation period as shown in Figure 5.3.3.2-2. This period comprises 30 days of tilling and 115~130 days of irrigation for a total of 145~160 days in a typical year. The extended period for irrigation in the downstream Bolana unit (Yala season) is assumed to be the result of delay in water distribution due to deteriorated facilities. Also, the start of the irrigation period in this sub-scheme is earlier than the WRB sub-scheme due to facilitated, managed diversion of water stored in Ridiyagama tank.

(3) Present Water Balance

The results of water balance calculation consider diversion discharge form Liyangastota anicut (as in the case of the WLB sub-scheme) and the storage capacity at Ridiyagama tank. The minor water shortage in the sub-scheme area (based on interview of farmers) is concluded to not be the result of a lack of water resources, but rather due to inefficient water distribution because of deteriorated facilities.

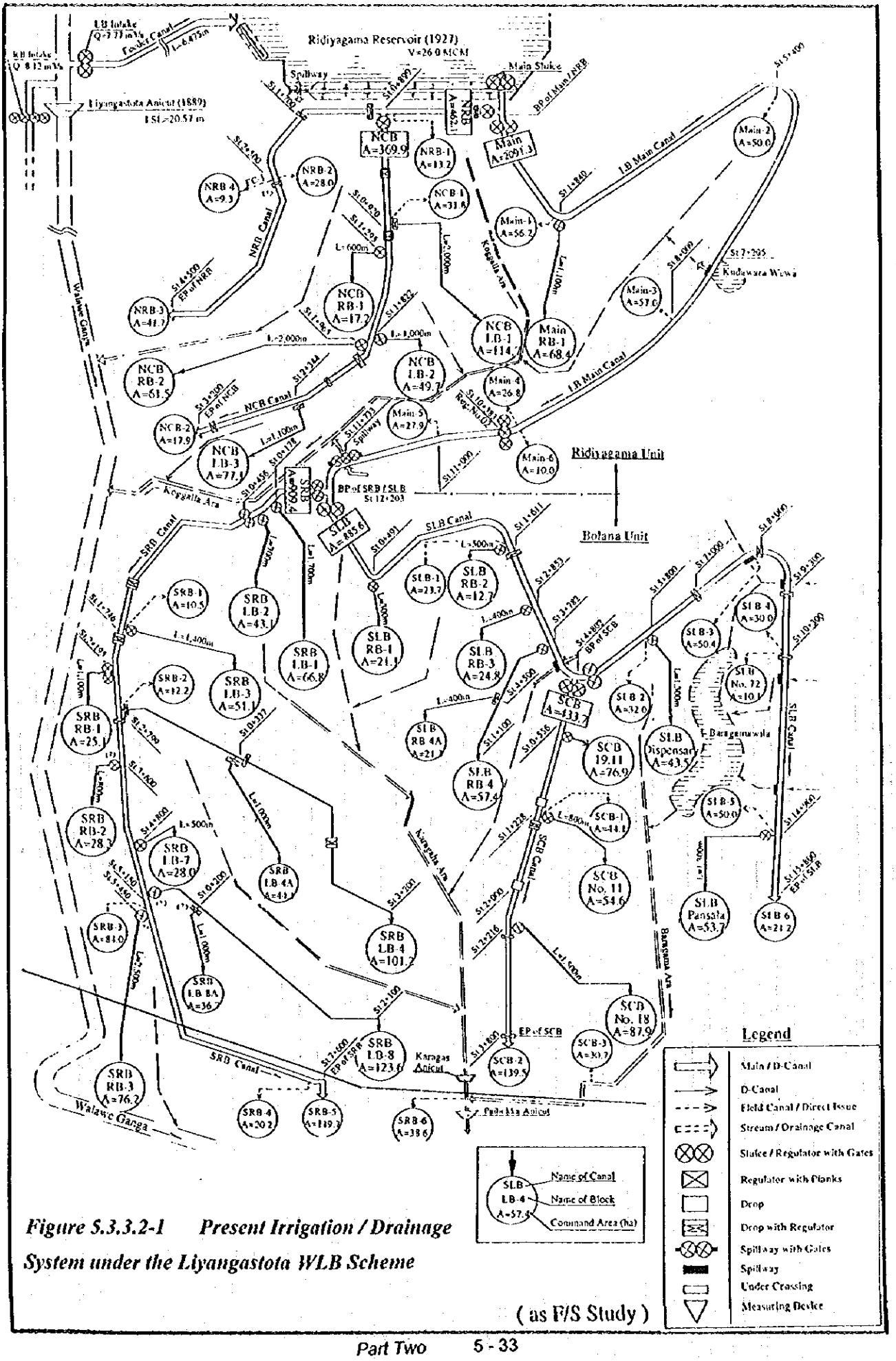


Figure 5.3.3.2-1 Present Irrigation / Drainage System under the Liyangastota WLB Scheme

(as F/S Study)

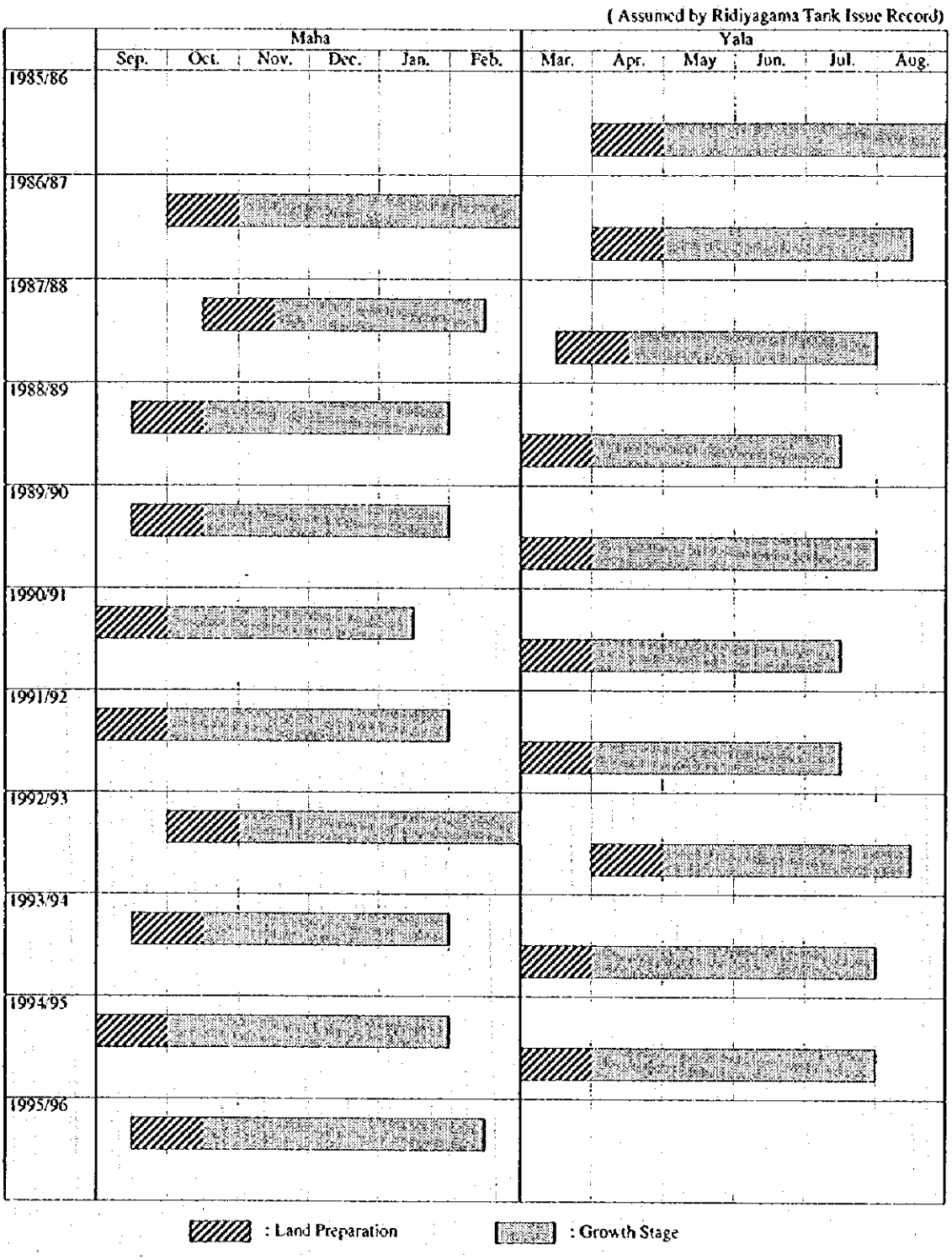


Figure 5.3.3.2-2 Irrigation Period for Liyangastota WLB Sub-scheme (1985/86 ~ 1995/96)

Year		① Potential diversion from Ridiyagama tank (1,000 m³)	② Discharge possible for irrigation (① × 50%) (1,000m³)	③FWR (mm)	④Irrigable area (ha)	Irrigation rate (%) ④ / 2,533 ha
1985/86	Yala	72,846	36,423	1,323	2,899	114
1986/87	Maha	66,584	33,292	1,096	3,319	130
	Yala	57,473	28,737	1,323	2,559	100
1987/88	Maha	55,629	27,815	1,047	3,158	124
	Yala	63,587	31,793	1,363	2,800	110
1988/89	Maha	57,351	28,675	1,095	3,407	133
	Yala	56,849	28,424	1,266	3,490	98
1989/90	Maha	56,718	28,359	1,095	2,754	108
	Yala	65,162	32,581	1,266	2,774	109
1990/91	Maha	41,353	20,677	1,165	2,878	113
	Yala	61,920	30,960	1,266	3,085	121
1991/92	Maha	62,551	31,276	1,165	3,470	136
	Yala	35,557	17,779	1,266	1,619	63
1992/93	Maha	53,277	26,638	1,096	3,019	118
	Yala	60,503	30,251	1,323	2,697	106
1993/94	Maha	41,894	20,947	1,095	2,931	115
	Yala	67,680	33,840	1,266	2,917	114
1994/95	Maha	52,599	26,299	1,165	3,185	125
	Yala	68,327	34,164	1,266	3,060	120

note: Water balance calculation is according to the following criteria:

Potential diversion from Ridiyagama reservoir:	computed on the basis of values obtained under Phase II
Potential diversion from Liyangastota:	computed on the basis of the possible diversion discharge at the intake weir as used in Phase I (Master Plan study), and reflecting the irrigation discharge utilized under the WLB scheme.
Potential irrigation discharge:	current irrigation efficiency assumed at 50%.
FWR (field water requirement):	adopts the actual irrigation period as identified under the Phase II study.

(4) Assessment of Present Irrigation / Drainage System under the WRB Sub-scheme

1) Water source

Calculation of present water balance indicates stable and adequate water resources during the Yala and Maha seasons. (However, the 63% irrigation rate for the 1992 Yala season as a result of the water balance calculations has been eliminated from the evaluation of water source under the present condition due to lack of complete discharge records for Ridiyagama reservoir, and based on the results of interview

survey and on the fact that the WRB area on the opposite bank which draws from the same water source exhibits an irrigation rate of 310%.)

2) Main turnout facilities

The main turnout facilities at 4 locations are damaged and inoperable. Currently, ID engineers distribute water through the facilities based on past experience. It is thus necessary to newly construct turnout facilities which will enable planned water allocation throughout the entire sub-scheme area.

3) D-canal turnouts and water level regulating gates

During field survey, almost all interviewed farmers stressed the need for rehabilitation of these facilities.

In addition to the 51 sites surveyed, farmers themselves have constructed simple turnout facilities in the canals. Also, the 51 sites of existing facilities have been constructed reflecting irrigation diversion practices over the past 70 years, and the locations of these facilities should be appropriately preserved under the Project.

4) Water Conveyance Capacity of main · branch · D-canal cross-sections

The LB main canal and the NRB, NCB, SLB, SRB, and SCB branch canals in particular exhibit marked deterioration, with canals not preserving their original design cross-sections. Along their entire lengths there are instances of embankment collapse and distortion of the design canal gradient. Urgent rehabilitation is required. Sections along the foregoing main and branch canals requiring urgent cross-section improvement are as indicated below:

Main / branch canal	Total canal length (km)	Segment length requiring cross-section improvement (km)	
<Ridiyagama unit>			
LB main	12.20	12.20	(100%)
NRB	4.50	1.70	(38%)
NCB	3.20	2.34	(73%)
<Bolana unit>			
SLB	15.80	10.30	(65%)
SRB	7.60	5.45	(72%)
SCB	3.80	3.80	(100%)

Along the entire length of the D-canals, slope collapse and sediment buildup in the canals is seen, and rehabilitation works are necessary to address this. Since the D-canals convey water directly to the individual beneficiary farmer's fields, they are more frequently used than the above main and branch canals, and farmers accordingly strongly desire their rehabilitation. In conjunction with the foregoing, farmers also want the construction of tractor field roads which are utilized for equipment access during planting, and to transport farm produce. Land for routing of these roads can be obtained on the land designated by the ID for the D-canals.