In the case of the Bank of Ceylon in 1993, recovery rate for subsidiary food crop loans dropped to 60.8% compared with that for 1990 of 86.9%. Crop-wise loan proportions in this category for 1993 were 51.7 for potato, 29.2% for chili and 12.4% for red onion. (see App. 2.2-48)

It is considered that the above drop in loan recovery rate is due to the fact that loan rate (interest) is uniform regardless of farm scale, with small holders, tenants and small farmers lacking the financial capability to make payments on debt. This in turn induces an increase in the bad debt held by funding banks, and obstructs efforts to expand the rural credit system. Thus, credit requirements should be more flexible, i.e. set according to farm scale, in order to promote more efficient loan recovery.

Deposits and advances at Bank of Ceylon Sub-offices at Agrarian Services Centres are as indicated in App. 2.2-49. In the case of deposits as of 1993, Kalutara district shows a total of Rs 22 million, which represents a 44.6% increase over the previous year. Although this is the highest figure for the three districts excluding Hambantota, it is slightly below the national average (up 54.1% over 1992). Deposits in Galle district show a less dynamic trend, with only a 19.6 % increase over the previous year (1993 total at Rs 6.6 million). Deposits in Matara district show an even lesser growth rate over the previous year of 15.2%, which falls considerable below the national average rate of a 28.0% increase. In the case of all the subject districts, size of individual accounts is small, averaging Rs 5,000~6,000. From the standpoint of utilizing deposits as the original source for credit to farmer groups and small and medium entrepreneurs, it is considered essential to the active performance of the rural economy that the fund circulation rate be accelerated through improved saving and loan recovery rates.

In addition to crop cultivation loans, various development credit schemes targeted at the rural sector are being actively pursued by the Government. According to Bank of Ceylon statistics, programs aimed at development of self employment opportunities by far account for the largest proportion of credit extended under such schemes. As of June 1994, Matara district in particular exhibited remarkable activity in this regard. Other development credit schemes include schemes for farm machinery and equipment and agricultural inputs and supplies, perennial crop production schemes, livestock and dairy development schemes, fisheries schemes, Janasaviya Trust Fund, etc. (see App. 2.2-50).

Rates on deposits and advances for 1994 are as shown in App. 2.2-51 and App. 2.2-52. Annual rate for paddy cultivation fund and new comprehensive rural credit fund is 16%.

At present, in correlation with the Structural Adjustment Program being pushed by the World Bank, Regional Rural Development Banks play an important role in supporting Government policy in this regard, as these banks were established with the twin objectives of reducing unemployment and alleviating poverty through the promotion of rural industrialization. The said banks actively provide funding to various agricultural, industrial and commercial projects. It should be noted however that the World Bank is recommending their privatization.

4.2.2 Livestock Industry

The Department of Animal Production and Health (DAPH) of the Ministry of Livestock

Development and Rural Industries engages in support activities for the livestock industry including animal disease control. Extension offices of the DAPH at the district level comprise veterinary surgeons offices, of which 4 are located in Kalutara District, 4 in Galle District, 3 in Matara District and 3 in Hambantota District. (see App. 2.2-53)

With an increased consumer interest in diary products under the government livestock industry policy, emphasis has been placed in recent years on development of the dairy industry targeted at increase in milk consumption (from 327 million ℓ in 1995 to 607 million ℓ by 2000), expansion of fresh milk consumption, increase in production of domestic dairy products (reduction of imports at 40,000 t in 1994 to 30,000 t by 2000), and increased production of formula feeds.

According to district-wise statistics for 1993, in Hambantota District numbers of cattle and buffalo being raised were 5.4% and 11.7% respectively of the national totals. Nevertheless, these figures represent declines by 11.5% and 7.7% respectively compared to 1990 totals for the district. Raising of goats, pigs, chickens and ducks is widespread in Kalutara District, situated close to the major consumption center of Colombo. Specifically, poultry raising in the district accounts for 7.8% of the total national production. (see App. 2.2-54) This steady development of the livestock industry not only improves the nutrient intake structure of the rural population but also ensures a stable supply of dairy and other livestock products to urban populations.

In Hambantota District where a relatively thriving livestock industry is seen, lack of sufficient grazing land for cattle and buffalo often results in animal intrusion into chena cultivated land, paddy field and home gardens. To rectify this situation, the DAPH's veterinary surgeon's offices view the securing of designated grazing areas, strict registration of livestock, and establishment of livestock markets as important goals.

As indicated in App. 2.2-55, target levels of pasture land development in 1995 under the pasture and fodder establishment program are 4 ha in Kalutara, 3 ha in Galle, 7 ha in Matara and 3 ha in Hambantota. Matara in particular shows a significant area target for development.

Prices of livestock and poultry products are shown in App. 2.2-56. Mutton prices are highest, followed by pork and beef.

Organization of diary farmers is being actively pursued, with milk producers co-operative societies having been established at the district level. One such organization operated in Hambantota District. Milk chilling centers are located one each at Tissamaharama and Ambalantota D.S. divisions. In 1993, the bulk of milk produced in the Southern Province was from Hambantota District (57.8% of the province total).

In order to establish effective commodity production bases under modern livestock industry in areas proximate to the major consumption centers, it is essential to (i) improve the marketing system for livestock products, (ii) to specialize and intensify livestock production, and (iii) strengthen related forward industries engaged in the supply of animal feeds and related backward industries with process and distribute livestock products. Furthermore, to make the foregoing possible, it is necessary to stabilize prices for livestock products at a level which provide an incentive to farmers to engage in animal husbandry.

4.2.3 Fisheries Industry

According to 1993 statistics, catches in Galle District accounted for 8.4% of the national total, while those in Hambantota, Matara and Kalutara districts accounted respectively for 8.1%, 8.0% and 5.4% of the national total. All four districts show growth rates in this regard over 1990 that are well above the national average rate of 3.7%. Specifically, the growth rate for total catch was a significant 32.8% for the 1990~1993 period in Kalutara District. In the case of sea fishing, coastal fishing is most widespread in Matara District, while seine fishing is the common method in Hambantota District. (see App. 2.2-57) Species caught under coastal fishing include thora, paraw, tuna, shark and skate, while those caught by seine fishing include herring and sardine. Thora fetches the highest price on the retail market. (see App. 2.2-58)

Fishermen continue to specialization their fishing operations, with fishing co-operative societies being established in all four districts relevant to the Study. According to 1992 statistics, 57 such organizations exist in Galle and Matara districts.

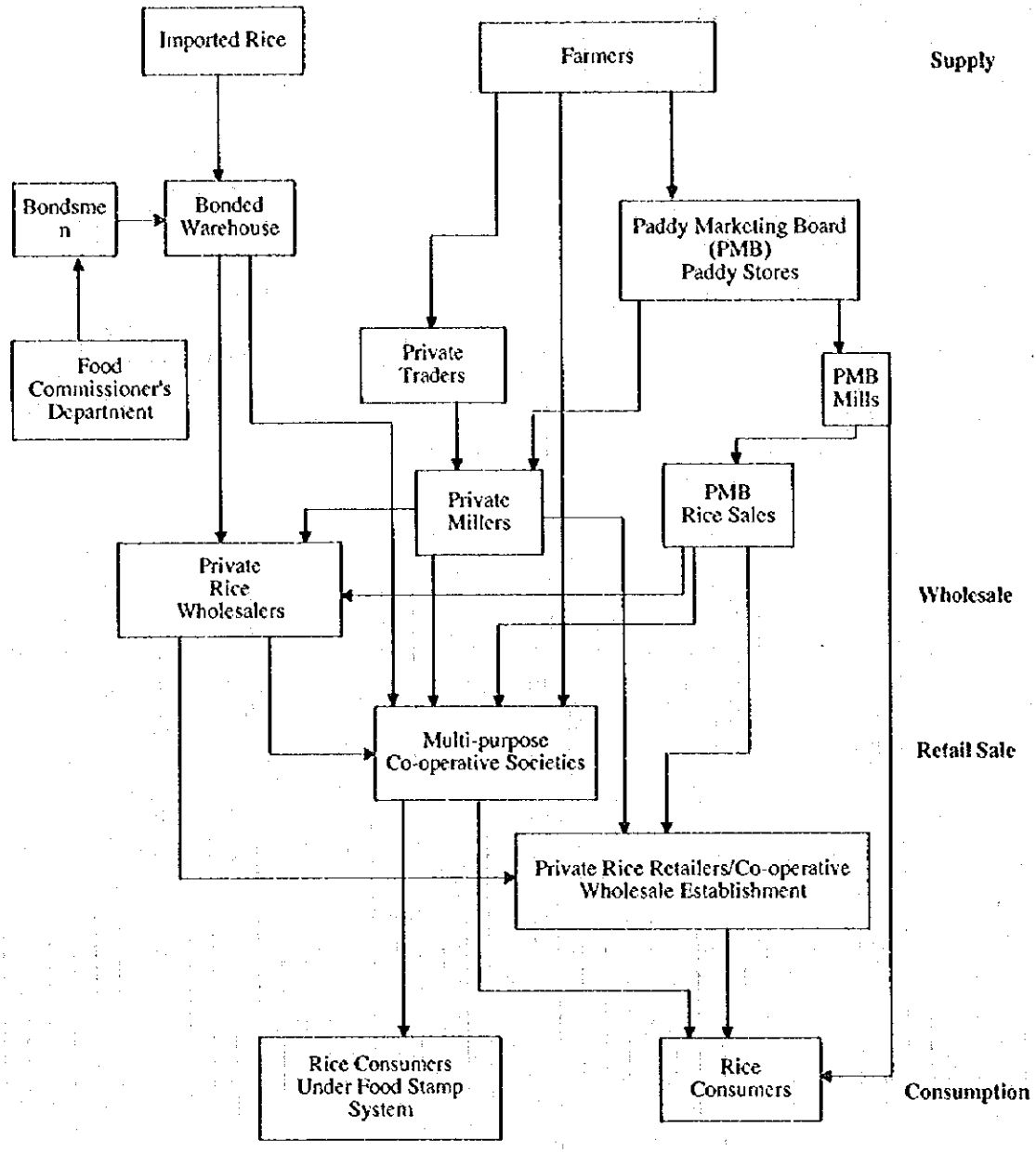
4.2.4 Rural Industry

The 200 Garment Industry program is currently being promoted nation-wide, and under the said program labor intensive garment factories are being constructed in all four of the Study area districts. In addition to providing job opportunities in rural areas where unemployment is high, the garment industry generates exports which earn valuable foreign exchange for the country. Behind this policy is the realization that the export oriented manufacturing sector centered on the garment industry provides the engine for economic growth under the Government's economic development strategy of shift from import-substitute industrialization to export-promoting industrialization, within the framework of a free trade policy.

As of 1993, 25 garment factories were in operation in the Study region (8 in Kalutara District, 6 in Galle District, 4 in Matara District and 7 in Hambantota District). In addition, the Koggala Free Trade Zone is planned to be established in Galle District as a part of the Government's export-oriented industrialization policy to invite foreign investments.

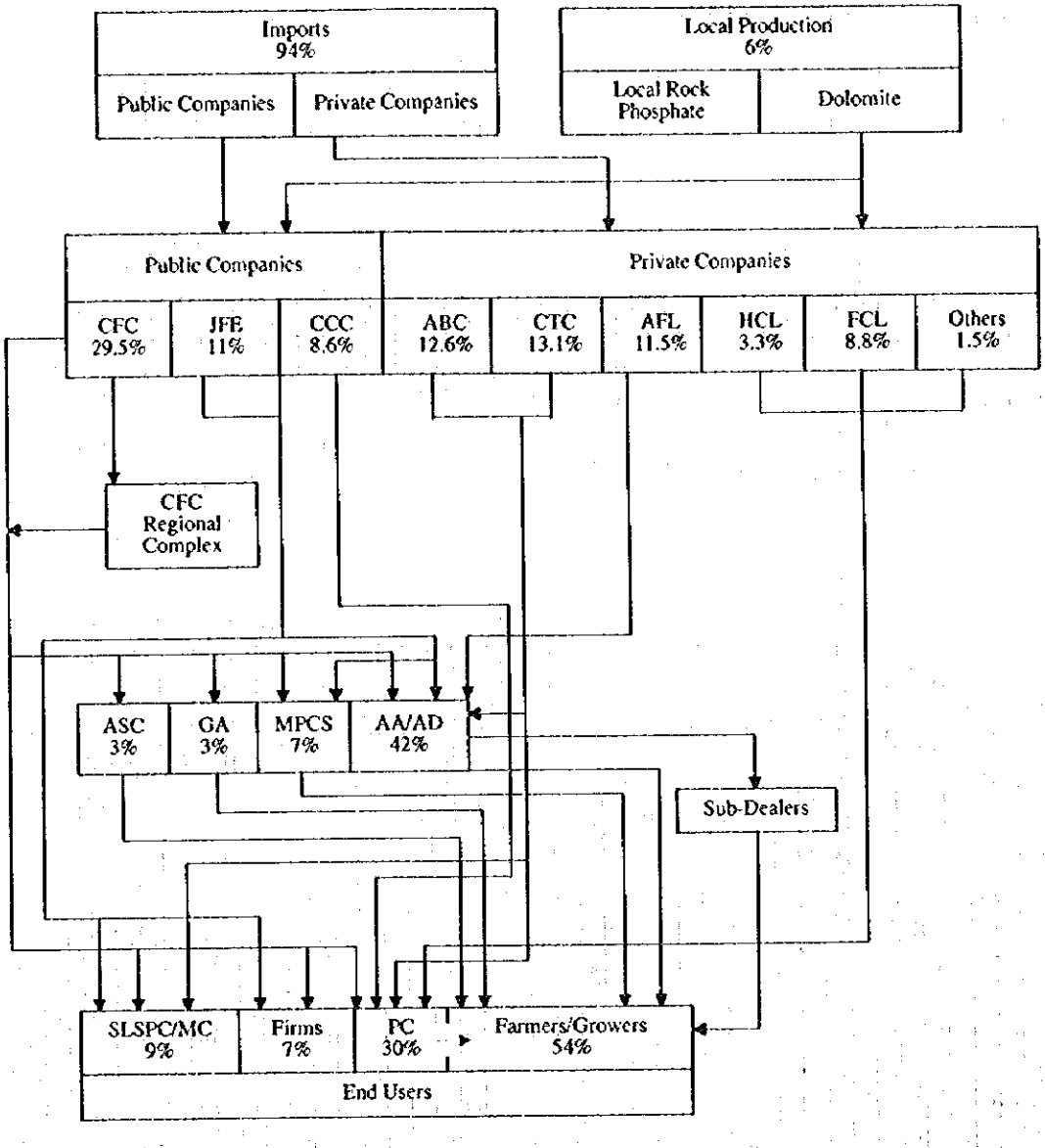
As agricultural diversification continues to progress, the emergence of a processing industry for agricultural and livestock products (food stuff, meats, dairy products, etc.), a production industry for formula feed, a canned goods industry and other agricultural related industries is desirable from the standpoint of increasing employment opportunities in rural areas afflicted by chronic high unemployment. Nevertheless, of even greater underlying importance is the upgrading of rural infrastructure as a means of improving the investment environment in rural areas.

The government places emphasis on the development of small and medium scale industries (including agro-base) in rural areas to create additional employment opportunities. Currently under study by the Government is the feasibility of introducing a Skills Development Fund to extend guaranteed loans to small and medium entrepreneurs who are not as yet solidly established and lack collateral for normal bank credit, and creation of an efficient vocational training system.



Source: Food Commissioner's Department.

Fig. 4.2-1 Channels of Paddy and Rice Distribution



Note:

CFC: Ceylon Fertilizer Co., Ltd.
CCC: Colombo Commercial Fertilizers Ltd.
CTC: Ceylon Tobacco Company
HCL: Hoechst Ceylon Company Ltd.
ASC: Agrarian Services Centres
MPCS: Multi-purpose Co-operative Societies
AD: Authorized Dealers
MC: Government Estate Management Companies
JFE: Janatha Fertilizer Enterprises Ltd.
ABC: A. Baur & Co., Ltd.
AFL: Anglo Fertilizer Ltd.
FCL: Falcon Commodities (Pvt.) Ltd.
GA: Government Agent
AA: Authorized Agent
SLSPC: Sri Lanka State Plantations Companies
PC: Private Customers

Source: Review of Fertilizer Year 1993, National Fertilizer Secretariat.

Fig. 4.2-2 Channels of Fertilizer Distribution (1993)

4.3 Socio-economic Conditions

Up to this time, investment in upgrading of infrastructure has been at a low level of 3~4% of GDP due to various fiscal constraints. Private sector investment in infrastructure development has remained depressed due to a combination of factors including difficulty in procuring capital (due to high interest rates and underdeveloped capital market), lack of domestic private investors, and lack of a legislative framework to promote investment. The present administration is attempting to attract private sector investment into the strengthening of hydropower, telecommunications, transportation, harbor and other infrastructure related facilities through introduction of Build, Own and Operate / Build, Operate and Transfer (BOO / BOT) programs.

4.3.1 Rural Infrastructure

(1) Roads and Highways

The road network in Sri Lanka comprises A and B class roads under the jurisdiction of the Road Development Authority (RDA) of the Ministry of Health and Highways, and C, D and E class roads under the jurisdiction of the provincial and local governments. RDA maintains branch offices at the district level in Kalutara, Galle, Matara and Hambantota which engage in road and bridge construction and maintenance. C, D and E class roads are maintained by the relevant local government authority.

App. 2.2-59 shows road kilometerage for each class of road on a district-wise basis. Road density is greatest for Galle District at 0.71 km/km^2. Benefit population per kilometer on a road class basis is highest for A and B class roads in Kalutara District (8,093 persons), and in Matara District for all road classes (936 persons).

In the case of roads in the Study region, a combination of inadequate maintenance and repair and the fact that roads are traversed by trucks overloaded with agricultural produce and inputs has resulted in road surface damage, and at locations pavement materials are exposed in places. It is urgent that this poor road condition be rectified since it is unsafe and results in load damage to agricultural products.

(2) Water Supply

In 1975, the National Water Supply and Drainage Board (NWSDB) was established under the Ministry of Housing, Construction and Public Utilities and engages in the design, construction and maintenance of water supply and sewerage systems. The NWSDB aims to realize water supply and sewerage service to the entire population by 2010.

Under active cooperation from the World Bank, ADB and other international funding agencies and donor nations, capital investment in water supply projects in 1994 reached Rs 2,460.7 million (65.7% from off shore). (see App. 2.2-60)

NWSD maintains district level offices in the 3 districts of Kalutara, Matara and Hambantota within the Study region which engage in the operation and maintenance of medium to large

scale water supply facilities. Small scale facilities and wells fall under the jurisdiction of the relevant local government agency.

In the case of water for domestic purposes for the benefit population with the Study areas, supply is by water service facilities (including common hydrants) in urban areas and by wells in rural areas. Extension rate for water supply on a district-wise basis in 1992 is as shown in App. 2.2-61. Intake rate from piped schemes is highest in Hambantota District at 22% and lowest in Galle District at 3%. Intake from unprotected sources for the 4 districts is 45~64%. At the D.S. division level, water supply coverage is high in Angunakolapelessa, with benefit households at 85% of all households. In contrast, coverage is low in Hambantota D.S. Division at 39%.

(3) Electrification

The Ceylon Electricity Board (CEB) established in 1969 under the Ministry of Irrigation, Power and Energy, engages primarily in the design, construction and development of generation, transmission and distribution facilities. In collaboration with the Ceylon Petroleum Corporation and Mahaweli Authority, CEB essentially oversees the entire power sector of the country. CEB maintains branch offices at the district level within all four of the districts of the Study region, which pursue programs to electrify rural areas.

At present, various rural electrification schemes are in progress under which an economic internal rate of return of over 12% is adopted as a criterion for feasibility of implementation. The Rural Electrification Project I was carried out under funding from ADB.

Although average growth in power demand over the past 20 years has been 7.8% per annum, it surpassed 10% in 1993. Island-wide electrification rate in 1994 was 44.2%. Of the four districts in the Study region, electrification rate is highest in Kulatara District at 63.7% and lowest in Hambantota District at 23.2% which is well below the national average. (see App. 2.2-62)

(4) Telecommunications

The Sri Lanka Telecommunication Department (SLTD) was created in 1980 and is responsible for overseeing telecommunication services in the country. The agency is under the Ministry of Posts and Telecommunications. Branch offices of the agency are located at the district level in the four districts of the Study region. At present, SLTD is in the process of undergoing privatization.

Under its telecommunications development policy, SLTD targets (i) installation of 500,000 telephone units by 1995 and 800,000 units by 2000, (ii) effective utilization of human resources, (iii) productivity increase, (iv) achievement and maintenance of international quality standards, (v) generation of funds to meet capital investment requirements, and (vi) high profitability (minimum rate of return of 15%).

Telephone extension rate in the districts of the Study area range from 5.09 units per 1,000 persons in Kalutara to a low of 2.28 units in Matara. At the D.S. division level, Hambantota has the highest rate at 9.48 units per 1,000 persons, and Weeraketiya the least at 0.82 units.

(see App. 2.2-63)

(5) Education

Compared to neighboring countries, Sri Lanka enjoys an extremely high literacy rate (90%), primary education rate (90%) and secondary education rate (75%). These high achievements have been supported by extensive fiscal expenditure (around 9~10% of GDP during the 30 year period 1950~80). However, by 1990 outlays by education related agencies had halved to 2% of GDP as compared with 4% in 1960. Proportion of such outlays within total budgetary expenditure had likewise dropped from 15% to 5% over the same period. This has the potential to adversely affect the quality of primary and secondary education and is a factor in inequities of resource allocation by region and by educational facility.

In light of the above situation, the current administration has prioritized human resources development including education as a central issue under development strategy aimed at economic growth with social equity. In line with this, redistribution of public funds is recognized as urgent to rectify regional disparities in education levels by region and education facility. Introduction of an extensive vocational training system is also recommended.

School density (per 1,000 persons) by district in 1993 for the Study region districts ranged from a high of 1.19 schools in Hambantota District to a low of 0.94 schools in Kalutara District. At the D.S. division level, Weeraketiya had the highest rate at 1.64 schools per 1,000 persons, and Ambalantota the lowest at 0.91 schools which is below the district average of 1.19. (see App. 2.2-64)

(6) Medical Services

The higher disease rate in rural areas compared with urban areas is the central most pressing issue under the Government's medical services policy. The current administration is pushing for increased fiscal investment in the medical services sector aimed at reduction of the outbreak rate for preventable diseases and establishment of a base level of medical service throughout rural areas, particularly targeted at poverty income groups.

The Ministry of Health and Highways oversees the medical services sector at the national level, and maintains regional health officer's offices at the district level.

As indicated in App. 2.2-65, Hambantota District has the highest level in terms of density of medical service facilities (per 1,000 persons) and Matara District in terms of bed number (per 1,000 persons). At the D.S. division level, Hambantota exhibits the highest bed density at 3.49 (per 1,000 persons) and Weeraketiya the lowest at 0.28.

Birth rate in 1992 for Matara District exceeded the national average, while those for Kalutara and Hambantota were below the national average. Mortality rate was highest for Galle, while Hambantota showed the lowest of all four districts at a level below the national average. Infant mortality rate in 1991 for Hambantota District was 6.4 per 1,000 persons, which is well below the national average. (see App. 2.2-66)

4.3.2 Poverty Alleviation

Under its welfare policy, the Government has in place a school lunch program, food stamp system, and the Janasaviya Programme. The Janasaviya Programme in particular plays a central role in efforts to eradicate poverty. Under the program, inaugurated in 1989, income subsidies are provided to poverty income earners making less than Rs 700 per month, and the Janasaviya Trust Fund is available to individuals to create their own employment opportunities. This recognition of the need to reorient the thinking of the impoverished segment of society in a positive and productive direction makes the program a unique one.

Under the Janasaviya Programme, a monthly amount of Rs 2,500 is paid over a two year period to households below the poverty line (Rs 700 per month income). Of this monthly amount, Rs 1,458 is paid in the form of stamps, and the remainder in cash which automatically goes into a bank account of the beneficiary subject to not being withdrawable for a 2 year period.

Thus two objectives of the program are to promote self-help creation of job opportunities, and through new employment to contribute to upgrading the living standards of the impoverished segment of society, and the program is applied widely in the various sectors by district and D.S. division governments.

Other projects which are funded through the Janasaviya Programme include rehabilitation and upgrading of rural infrastructure, extension of credit for agriculture - small rural industries - livestock industries, human resources development aimed at improvement of technology and skills, and uplifting of the nutritional status of pregnant mothers and children.

To replace the Janasaviya Programme, the present administration has launched the Samurdhi Programme under which grants are extended to target a 1~1.2 million households below the poverty line. Placement of a portion of the grant in a savings account is compulsory in an effort to instill a "saving is virtue" mentality among the recipients. A Samurdhi Foundation is also to be established at the Grama Niladari Division level, to function in parallel with the former Janasaviya Fund which is renamed the National Development Trust Fund.

According to D.S. division level statistics, recipient households (below the poverty line) of the government relief fund range around 40~80% of the total households for each D.S. division. Weeraketiya shows a particularly high ratio of such households at 73.8%. As of 1993, the average unemployment rate island-wide was 13.8% (percentage of total labor force population), and 14.5% in urban areas and 13.7% in rural areas. At the D.S. division level in the Study region, unemployment rate exceeds 20 % (percentage of total population) in both Angunakolapelessa and Ambalantota which if converted into proportion of total labor force would yield an extremely high level implying a potential state of full unemployment over a wide area. (see App. 2.2-67)

4.4 Land Use

4.4.1 General Land Use

Based on the Land Use Maps by Survey Department, Land Use in the southern region, Kalutara, Galle, Matara and Hambantota districts, is summarized in below.

Unit : hectares

Category	Kalutara		Galle		Matara		Hambantota		TOTAL	%
		(%)		(%)		(%)		(%)		
Urban Land	1,370	0.9	740	0.4	620	0.5	2,430	0.9	5,160	0.7
Agricultural Land	137,850	86.3	133,850	81.0	103,630	80.8	151,250	57.6	526,580	73.6
Forestland	16,610	10.4	23,600	14.3	18,670	14.6	50,940	19.4	109,820	15.3
Rangeland	730	0.5	1,870	1.1	3,270	2.5	41,920	16.0	47,790	6.7
Others	3,200	2.0	5,100	3.1	2,060	1.6	16,010	6.1	26,370	3.7
TOTAL	159,760	100.0	165,160	100.0	128,250	100.0	262,550	100.0	715,720	100.0

Source: Land Use Maps (Kalutara 1981-84, Galle/Matara and Hambantota 1983), Survey Department 1986,87

Approximately 74% of the total land is used as agricultural land. However, in Hambantota district, percentage of agricultural land is low at 57% in compared with the other three districts. Forestland occupies 15% of the total land; 19% in Hambantota district, 10% in Kalutara district. The other, rangeland (scrub and grasslands) occupies 16% in Hambantota district.

4.4.2 Farm Land Use

Agricultural land use in Hambantota district, where the five schemes are situated; Liyangastota, Muruthawela, Badagiriya, Kachigala and Thangalu scheme, is characterized by large extent at 26% (69,000ha) of Chena (shifting cultivation) or abandoned area, and at 0.8% (2,000ha) of Grassland.

The area of plantation tree crops in Hambantota shows rather small extent at 3,4% (8,900ha) by only coco-nuts trees, half of which is estimated for small holders' plantation, compared with the area in other districts, 32% (51,000 ha) of Rubber in Kalutara or 16% (20,000ha) of Tea in Matara (App.3-12).

Paddy land in Hambantota is 28,000ha, 65% (18,000ha) of which is classified as Major Schemes area showing 160% of cropping intensity.

Upland in Hambantota is 18,000ha, which is mainly located in dry zone and mostly used for permanent rainfed cropland.

4.5 Irrigation Development

The ancient irrigation and farming system in this region was operated by the utilization of cascade type village tanks in practically all the small tributaries of the rivers in the basin.

Since Irrigation Ordinance enforcement in 1856, the Irrigation Department had been continued to concentrate on the restoration and enforcement of the ancient irrigation systems in the North Central Province (NCP), while in the Southern Region had not given much less attention.

Unlike the NCP which gets much rainfall during monsoon seasons, the Southern Region could get only marginal rainfall from both seasons. For this reason, the volume of work under taken was limited to the restoration of a few portion of the ancient irrigation systems.

The major restoration in this region were Liyangastota anicut in 1889, Ridiyagama tank in 1927 on the main Walawe Ganga and Badagiriya tank in 1957, located on Malala Oya Basin.

After these restoration, the GOSL established Uda Walawe and Kirindi Oya irrigation and settlement projects financed by Asian Development Bank in this region. The studies for these two major projects were carried out by Irrigation Department, adhering to the conventional irrigation and farming system, aimed essentially for paddy farming.

Recently, the GOSL has given the priority for irrigation water management in existing schemes, through farmer participation, increasing the productivity through crop diversification and system water management. For this policy, HIRDP initiated these programs about a decade ago, thus Kirama Oya and Urubokka Oya projects were undertaken as HIRDP form 1980 to 1986. However, these projects seem to be not successful due to lack of project budget.

Nevertheless these efforts, serious deterioration and inefficiency of irrigation facilities have been left in this region. The present condition of these irrigation facilities as well as improvement of operation and maintenance to keep them functioning will be essentially needed for the development of this region.

4.6 Drainage Development

4.6.1 General

It may be mentioned that, in many agricultural development projects implemented in Sri Lanka, more attention had been paid to irrigation than to drainage until the need of drainage was really recognized. Because implementation of those projects was initiated in such areas where much attention to drainage was not needed. And it seems that this situation had not created much problems with drainage of the implemented schemes because the areas where the schemes were implemented usually had relatively large rivers which could function as natural drainage channels of the schemes. However, requirement in food supply for increasing population had brought need of implementation of agricultural development projects in the relatively low areas where drainage is definitely needed. With this background, large scale irrigation cum drainage schemes with the function of salt water exclusion had been implemented since early 1940's, especially in the southern part of Sri Lanka where average annual rainfall of 1,500 to 4,000 mm is commonly observed. However, those schemes have become old and most of them have lost their originally designed functions as irrigation cum drainage schemes and the cultivable areas under the implemented schemes have been deceasing rapidly. In this sense, importance of drainage engineering for agricultural development especially at low lands and salt-water-affected areas is increasing. To cope with this, Department of Irrigation has been making efforts to develop drainage engineering which meets present requirement needed in planning, designing and implementation of drainage cum irrigation schemes and the results have been compiled into different types of design manuals as well as into reports for irrigation and drainage projects. One of them is listed below.

" Design of Irrigation Headworks for Small Catchments " written by A.J.P. Ponrajah and published by Department of Irrigation in May 1984.

Other than this, Department of Irrigation holds many reports on irrigation and drainage projects of different size and nature, in which project-wise design criteria are given. Some of them are listed below.

(1) Final Report of Gin Ganga Regulation Project, by The Water Conservancy Department of Hunan Province, The People's Republic of China, prepared in April, 1984.

(2) Report on Nilwala Ganga Flood Protection Scheme, Phase-2, prepared by GERSAR, France in October 1981.

4.6.2 Representative Schemes Under the Category of Drainage

As representative schemes under the category of drainage, following two schemes in southern part of Sri Lanka may be introduced.

(1) Nilwala Ganga Flood Protection Scheme

(2) Gin Ganga Flood Protection Project

Detailed information on these two schemes are already given in chapter 3 of the report (see section 3.2 of chapter 3 of the report).

4.7 Environmental Conditions

4.7.1 Soil Erosion

Soil erosion depends largely upon slopes, method of cultivation and kind of cultivated crops, especially, this tendency becomes severe in case of tea plantation and tobacco cultivation without proper measures against erosion as well as in case of chena cultivation. For example, it is known that intensity of soil erosion in tea plantation without proper measures against soil erosion becomes 100 times severe than in the case when effective measures are taken.

Rubber and tea plantation are dominant in the wet zone of the southern districts of Sri Lanka. In Kalutara district, rubber trees occupies 32 % of the total land of the district. It is said that land clearing with a frequency of once in twenty to thirty years is required for the areas where rubber trees are grown. In Matara district, tea plantation occupies 16 % and sparsely-used farmland occupies about 9 % of the total land of the district. In Hambantota district, sparsely-used farmland occupies 16 % and scrub land occupies 15 % of the total land of the district respectively. It is anticipated that, in the said areas, soil erosion will become severe unless proper measures are taken against soil erosion (App.3-12 and 14).

4.7.2 Waterlogging and Salinity in Soil

(1) Wet Zone

In the coastal peneplain of the wet zone, bog or semi-bog soils are waterlogged and they are suffering from salinity problems caused by intrusion of saline water from the sea.

(2) Dry Zone

The lands consisting of alluvial soils along the bottoms of the valleys and coastal plains are suffering from waterlogging and frequent flooding, especially, those along the coast are suffering from salinity problems. Saline water intrusion due to lack of proper SWE structures further accelerates these problems.

4.7.3 Wildlife

(1) Flora and Fauna

Depending on the bioclimatic zone (App.3-1), flora in the southern region can be classified into 4 distribution areas. The natural vegetation of thsose areas is identified to include some major plant communities listed in below.

Table 4.7-1 Plant Communities by Bioclimatic Zone

Zone	Plant Community
Arid Zone:	Tropical Thorn Forest
Dry Zone:	Dry Evergreen Forest
	Moist Deciduous Forest
Intermediate Zone:	Moist Semi Evergreen Forest
	Wet Semi Evergreen Forest
Wet Zone:	Tropical Wet Evergreen Forest

In addition to natural forest in the interior, river estuaries and lagoons are areas of high bio-diversity, including large swaths of mangrove forest and other thriving vegetation along brackish water edges. Mangrove provide an abundance nutrient source for aquatic wildlife species, forming an important part of the food chain. Mangrove also functions to remove impurities in river water entering the estuaries and lagoons (App.3-2).

The greater part of endemic species of fauna live in wet zone,especially in forests.

Wild elephant, a globally endangered species, make their home in Dry Zone (except in the dry season when they emerge from arid forest into wetlands:App.3-3). Population of wild elephant centering on Yala National Park was estimated at 800 in 1959.

Table 4.7-2 Number of Endemic Species by Bioclimatic Zones

	No. of species	No. of endemics	Distribution of endemic species		
			LCWZ	HC	LCDZ
Fish	59	16	15	4	3
Amphibia	37	19	9	12	3
Reptles	139	72	51	30	32
Birds(resdent only)	237	20	13	14	4
Mammals	85	12	6	9	–

Sources ; Kotagama, S.W.(188)Wildlife in Seminar on Environmental Education in Sri Lanka

(2) Parks and Wetlands in the Southern Region

Yala National Park and Bundala bird sanctuary are located in the Southern Region, as is the Uda Walawe Sanctuary encompassing the area around Uda Walawe Reservoir on the Walawe Ganga.(App.3-2)

According to the Directory of Asian Wetlands (Scott, 1989), major wetlands exist in Sri Lanka at 41 locations, of which 6 are in the Southern Province. Specifically, these are the Ruhuna (Yala) National Park, Palatupana Maha lewaya, Wiralira•Tissa•Debara and Yoda tanks, lewayas and kalapuwas in Bundala National Park, Maha and Karagan lewaya, Lunama and Kalametiya Kalapuwa. The CEA has published field survey reports on these areas as well as formulating conservation plans (Kalemetiya kalapuwa at the draft stage). In addition to the above areas, a conservation plan has also been prepared for the Bentara estuary.

In 1990, Bundala National Park was designated a Ramsar site under the Ramsar treaty, due to its recognized value as a natural resource and ecosystem, particularly as a habitat for globally rare and important water fowl.

(3) Inter-relationship Between Wildlife and Human Population

Increased development activities, the practice of chena, etc. as a result of population growth has caused cutting of natural forest and degradation of wetland, in turn reducing various species of rare wildlife whose habitats depending on these areas. In addition, agro-chemicals and fertilizer use on farm land may contaminate rivers and lagoons, causing concern for their impact on the wildlife in and around these.

Furthermore, large scale projects which promote human resettlement in areas of wild elephant habitat has resulted in more and more restricted movement of these animals and damage to farmland and dwellings, and sometimes personal injury to residents as well.

4.7.4 Health

(1) Malaria

Major diseases in Sri Lanka spread by insect vectors include malaria, filariyasis, dengue and haemorrhangic fever. Island-wide in 1988, malaria was the number four reason for hospital care, with an outbreak frequency of 852 persons per 100,000 population.(Table 4.7-3) District-wise, the following were ranked first in the country in terms of malaria outbreak in 1988: Matale, Batticaloa, Trincomalee, Kurunegala, Anuradhapura, Polonnaruwa, and Moneragala all located in the dry zone. Of southern region districts, Hambantota was ranked fifth, Matara ninth and Galle and Kalutara under tenth in terms of the nation as whole.

Malaria is thus a major public health concern in the country. In 1946~1963, DDT spraying of breeding areas temporarily reduced the incidence of outbreak of the disease; however, it rebounded to be again reduced by spraying with Malathion. Nevertheless, malaria has again been on the increase since 1982. The malaria vector, the mosquito, breeds in stagnant pools or at the edges of slow moving water bodies, where sunlight is good. Stagnant pools in dry riverbeds of the Dry Zone make good breeding areas, thereby promoting the spread of the disease in these areas.

Elimination by spraying of Malathion or Penitrothton, or introduction of species of fish which prey on the mosquito larvae are measures being adopted under the current Anti-Malaria Campaign of the Government.

Table 4.7-3 Leading Causes of Hospitalization,1988

Diseases	Cases	% of Total Cases	Cases per 100,000 Population
Signs, symptoms and illdefined conditions	190,645	8.9	1149.4
Diseases of the respiratory system exculding diseases of the upper respiratory tract, pneumonia and influenza	188,895	8.8	1138.9
Traumatic injuries	180,990	8.4	1091.2
Malaria	141,309	6.6	852.0
Intestinal infections diseases	130,073	6.1	784.2

Source ; Study on the causes and Consequences of Natural Disasters and Protection and Preservation of the Environment, 1991

(2) Filariyasis

Area afflicted by filariasis extends along the coast from Matara to Negombo, and its spread appears correlated with the movement of population concentrated in this coastal area. Two varieties of mosquito are the vector for filariasis, which breed in water trapped in coconut husks, excavated pits of inland coral and clay mining, poorly maintained pit toilets, old tires, stagnant pools along canals, etc. Concentration of population in urban areas with poor sanitation gives further impetus to the outbreak and spread of the disease.

(3) Water Contamination

A health problem in Wet Zone is the spread of water borne diseases due to human use of contaminated water. In comparison to the more developed Colombo area, the population of the southern region often relies on unprotected wells and rivers for domestic water supply. Furthermore, running toilets are rare with most toilets being water seal or pit types often located nearby to pits and wells from which water for drinking is drawn. The poor state of sanitation facilities is a major contributing factor to this health problem.

Table 4.7-4 Source of Drinking Water in Southern Region in %

district	pipe water	protected wells	unprotected wells	river	not stated
Colombo	52.1	37.7	7.4	0.5	2.3
Kalutara	5.6	59.1	28.7	3.8	2.9
Galle	6.2	61.3	27.6	3.1	1.8
Matara	9.9	47.4	36.1	4.9	1.8
Hambantota	11.1	41.5	30.1	16.1	1.1

Source: Ministry of Hearth, Annual Hearth Bulletin 1991

Table 4.7-5 Type of Toilets in Southern Region in %

district	flush toilets	water seal	pit	bucket type	none & not stated
Colombo	20.6	39.1	24.5	4.9	10.9
Kalutara	2.9	38.3	31.7	1.0	26.2
Galle	2.0	31.7	37.6	0.2	28.6
Matara	2.1	22.4	54.2	0.4	20.8
Hambantota	1.7	7.7	63.7	0.6	26.4

Source: Ministry of Hearth, Annual Hearth Bulletin 1991

(4) Agro-chemical and Chemical Fertilizer Contamination

Contamination from insecticides, weedicides and other agro-chemicals as a potentially life-threatening hazard becomes problem. This pertains as well to the insecticides used to control malaria and filariyasis. Poisoning from these substances results from improper selection of type to used, or improper handling. Poor farmers tend to use cheap and highly toxic substances made by obscure manufacturers and place themselves in the danger of toxin skin contact or inhalation.
Contamination of water sources due to drainage from farmland where agro-chemicals and chemical fertilizers are in use became significant problem from the 1960's. Excessive use of fertilzers results in runoff wind or irrigation water into tanks and rivers, causing eutrophication which promotes the growth of algae, plankton and other plant life, shutting out sunlight below the surface and reducing the amount of dissolved oxygen in the water. This destroys the habitat of various aquatic wildlife.

Toxins in insecticides are carried into water bodies in dissolved or suspended form, where they are assimilated by plankton and other aquatic plant life, from where these toxins make there way up the food chain in ever more concentrated form to be eventually potentially ingested by humans.

In parallel to quality of water in tanks and rivers, contamination of groundwater is also assumed to be gradually on the increase, with potentially adverse impact on health when groundwater is tapped for drinking and other domestic purposes. Cattle, buffaloes, dogs and various livestock are likewise exposed to health hazards from contaminated water sources.

(5) Other Dangers

Paddy farming and chena pose the danger to humans of snake bite. Nevertheless, such cases are in almost all successfully cured through blood serum transfusions at area hospitals.

(6) Medical Services

Rate of beds per 1,000 population at Medical institutions in the Southern Region except the Matara district is below the national average of 2.9 (App.2.2-65).

4.7.5 Education

(1) Education Facilities,Teachers and Pupils

Ratio of teachers to pupils in the Southern Province is 1 teacher to 18~24 students. Ratio of schools to pupils is 1 school to 433~482 pupils. These are on a par with the nation as a whole. Dropout rates in the province as well are in line with the national average.

Table 4.7-6 Number of Students and Dropout rate in 1993

District	Student (pupils)	Students/Teachers (pupils)	Students/Schools (-pupils-)	Dropout Rate(%)	Year
Kalutara	224,726	23.5	482	3.53	
Galle	230,930	20.4	455	3.53	1992
Matara	182,857	18.0	463	3.93	1993
Hambantota	143,316	21.1	433	4.99	1993
Sri Lanka	4,285,064	23.5	427	*4.37	1992(*1993)

Source ; Southern Province in Figures 1993
Statistical Abstract 1993

(2) Literacy Rate

Literacy rates in the southern region are in the range 82%~90%. That for males alone is at 87~93% which is 6~12% higher than that for females alone at 76~88%. Literacy rates show a declining level as one moves farther south in the region, with those for Hambantota District being lowest. The average literacy rate island-wide is 87.2%, and with the exception of Matara and Hambantota, district the districts in the southern region show rates above this national average.

A breakdown of age-wise education level attained for 5 years and older in the Southern Province shows 10.3% with no schooling, and the remaining 1/3 leaving school after 5 years or less. Two thirds leave after 8 or less years, and 90 percent stop school after 10 years or less.

Table 4.7-7 Literacy Rate of Persons 10 years and over in Southern Region (1981)

District	Total(%)	Male(%)	Female(%)
Kalutara	90.3	93.2	87.5
Galle	89.8	92.7	87.1
Matara	85.8	90.2	81.7
Hambantota	81.8	87.5	75.8
Sri Lanka	87.2	91.9	83.2

Source ; Statistical Abstract of the Democratic Socialist Republic of Sri Lanka 1993

4.7.6 Fishery

The fishery industry has grown an average 62% in each of the Southern Province districts during the period 1981~1991 as shown in Table 4.7-8. Particularly catches around Tangalle in Hambantota District have shown a significant two fold increase during the said period. On the other hand, average fish catches island-wide have leveled off. Accordingly, the share of total domestic fish haul accounted for by the Southern Province alone has grown to one quarter, from 13% in 1981 to 24% in 1991.

This fishery growth is attributed largely to coastal operations, with inland fishery catches actually decreasing due to a combination of factors of privatization of fish farms which has reduced the numbers of fingerlings being released into tanks and rivers, the practice of channel wide net fishing which indiscriminately catches immature fingerlings along with adult fish, increase in the fishing population, shrinking mangrove forests, and changes in lagoon water quality (drop in saline content due to increased influx of fresh water from drainage, contamination with agro-chemicals, etc.), and lagoon silt buildup.(App. 3-4,App. 3-5)

Table 4.7-8 Active Fishermen Population (1989) and Main Fish Production (1991)

D.F.E.O. Division	No. of Active Fishermen	Fisheries Population	Production (MT)	Production Increase Rate (1991/1981)
Galle	3,590	14,813	13,429	+54.7%
Matara	4,426	18,213	12,597	+36.3%
Tangalle	3,354	13,892	12,086	+113.9%
Southern Prov.	11,370	46,918	38,112	+61.7%
Sri Lanka	98,444	412,200	159,151	-9.1%
year	1989	1989	1991	

Source ; Southern Province in Figures 1993

4.7.7 Women's Situation

Although a 30% difference existed between literacy rates for males and that of women in 1946, this had shrunk to around 8% in 1981 (men: 90.5%; women: 82.2%). Nevertheless, there exists a disparity between literacy rates for women in urban areas compared to rural areas, with the former at 91.0% and the latter at 78.0%. Particularly, in the case of women over 35 years of age, literacy rate drops as the age group gets higher (79.8% for the 35~39 age group as opposed to 53.9% for the 50~54 age group).

Table 4.7-9 Literacy Rates in the Urban and Rural Sector in Sri Lanka, 1981

age	Urban		Rural	
	Male	Female	Male	Female
5- 9	--	--	--	--
10-14	93.4	92.8	87.5	87.7
15-19	95.2	94.2	88.3	88.1
20-24	96.8	95.4	91.1	98.6
25-29	97.1	95.2	92.5	88.5
30-34	97.3	94.9	93.0	85.8
35-39	96.8	92.1	91.9	79.8
40-44	96.0	89.7	90.5	74.0
45-49	94.7	85.8	89.5	65.2
50-54	94.5	85.5	87.9	53.9
55-59	93.6	83.3	86.1	59.4
60-64	92.4	80.0	84.7	56.3
65-69	90.2	77.1	81.6	52.0
70-74	88.7	75.6	80.2	46.4
75+	87.4	70.3	75.0	41.4

Source ; Situation Analysis of Children & Women in Sri Lanka, 1987, UNICEF

Women are an important part of the farm and household work force in Sri Lanka, and in many cases in poor households are a major income earner particularly where the women is the head of the household. However, statistically overall the labor participation rate of women is low (22.5 % in 1981).

The results of interview survey of farm household women indicates that the interviewees work daily from around 5 a.m. to 8~10 p.m. virtually without rest, beginning with meal and school preparations for children in the morning, tending home gardens, preparing lunch, fetching water and firewood and doing laundry during the day, and then finishing the day by preparing dinner and cleaning up afterwards. Under the present condition, these women essentially have no time to relax or undertake an kind of self-help training. Water and firewood carrying are particularly arduous tasks. Wells or hydrants may be located at great distance from the home, and women will make trips (more than 10 times) in a single day to haul water by pots.
In addition to the above tasks as well as harvesting in the fields, women also engage in self employment including poultry raising, sedge cultivation and mat making.(App. 3-6)

The Women's Development Society provides support services to women, beginning operations in Hambantota in 1990 including creation of women's organizations in each village, and "Janashakti" to address poverty related issues from the women's perspective. The WDS also promotes improvement of nutrition, better infrastructure, savings, and better availability of credit for women. In Hambantota District, the Janashakti Banking Society extends credit of Rs 5,000 against collateral of Rs 500 to women's groups with a minimum of 5 persons collective guarantee. Women use this financing for home gardening and small industry enterprises.

Also, the Agrarian Training Center provides instruction in cooking and sewing which is open to all desiring recipients. The regional Mat Weaving Center provides training in mat making from sedge.

4.8 Related Agencies

While the 7 study areas are located in what is defined as the Southern Region, for administrative purposes the Bentara Ganga Right Bank comes within the area of the Western Provincial Council (WPC) and all other schemes are within the Southern Provincial Council (SPC) area. Nevertheless, other than Polwatta Ganga and Muruthawela schemes, the schemes are defined as inter-provincial schemes. All schemes other than Polwatta Ganga are operated and maintained by the Irrigation Department. Polwatta Ganga is maintained by the Provincial Director of Irrigation.

The senior staff responsible for the operation and maintenance of the schemes therefore are: Deputy Director of Irrigation Western Range (Bentara Ganga Right Bank), Provincial Director of Irrigation Southern Province (Polwatta Ganga), Deputy Director of Irrigation, Hambantota (Muruthawela, Liyangastota, Thangalu Welyaya and Kachchigala) and Chief Resident Engineer (CRE) Kirindi Oya (Badagiriya). All Range DDI's and the CRE have suboffices manned by Irrigation Engineers (IE) and other supporting staff. ID is responsible for all planning design and constructon of all irrigation systems.

In schemes where an irrigation management program is in place either under INMAS program or under MANIS program, a Project Manager from either IMD or ID is responsible for that function. Irrigation Engineer at Kalutara functions as Project Manager of the Bentara Ganga RB scheme under the MANIS program. Under the Muruthawela scheme, the IMD has a Project Manager and a PMC for Muruthawela LB scheme tracts II and III. There are no PMCs for Urubokka Oya and Kirama Oya but the IE, Weeraketiya is responsible for institutional development activities. Liyangastota LB is managed by an acting Project Manager from IMD under the INMAS program with a PMC, while the RB is managed by the Irrigation Engineer, Ambalantota as Project Manager and Chairman of the PMC. It is not clear whether the latter is under the INMAS program or the MANIS program; logically it should be under the INMAS program. Badagiriya is managed by the Project Manager of the Kirindi Oya scheme which is under the INMAS program of the IMD. In all schemes which have PMCs field level officials of related agencies such as DOA, DAS, CCB attend PMC meetings which are usually held once a month, and help in the coordination, especially of the agricultural program.

Irrigation schemes being agricultural enterprises 'per se' which operate in a wider development context in the rural economy, have to relate to a number of agencies state or otherwise, to be able to function successfully. Thus, there are many agencies at the Provincial, District and Divisional levels which impact on the functioning of irrigation schemes.

The current organizational structure for agricultural development programs within the Province is shown in Fig.4.8-1.

The Provincial Council, headed by the Chief Minister, and the Council of Ministers and supported by Secretaries and Directors at the senior official level has responsibility for the general administration and development work within the Province, in respect of functions devolved by Government under the 13th Amendment to the Constitution. At the District level is the District Secretary (or Government Agent) who functions directly under the central government but is often called upon to perform certain coordinating functions, e.g. the District

Secretary has some responsibilities under the Irrigation Ordinance in respect of inter-provincial irrigation systems. At the Divisional Level, the Divisional Secretary (DS) coordinates and directs a wide range of development and administrative activities including irrigation and agriculture. DS also has the statutory function of chairing the cultivation (Kanna) meetings in irrigation schemes each season.

The Provincial Ministry of Agriculture is responsible for a wide range of agriculture related activities. The national level DOA, DAS and DAP&H, for example, work through the Provincial Ministry of Agriculture which has Directors at the Provincial Level and Assistant Directors at the District level.

Agricultural crop extension is the responsibility of the Provincial Agriculture Department. It has an Assistant Director in each district and an Agricultural Instructor (AI) at the Divisional level. In Hambantota District, however, there is one more Assistant Director directly reporting to the DOA and responsible for inter-provincial irrigation schemes. Livestock development is the responsibility of the Provincial Director of AP&H, the Veterinary Surgeon (VS) at the District level and the Livestock Development Instructor (LDI) at the Divisional level. The CCB has a Regional Manager for each Region and a Coconut Development Officer (CDO) at the Divisional level. The above staff constitute the totality of the agricultural extension staff at the field level.

Agrarian Services Department (DAS) has a Provincial Director, an Assistant Director at the District level and a Divisional Officer (DO) at the Divisional level. Their responsibilities primarily are the organization and registration of FOs under the Agrarian Services Act, the maintenance of the minor irrigation schemes and the provision of inputs for agricultural activities through the Agricultural Services Centres (ASC). The department cooperates with ID and IMD in registering FO's in the irrigated areas.

The Paddy Marketing Board (PMB) has Regional Offices in principal paddy growing areas to purchase paddy from farmers and from cooperative societies under the guaranteed price scheme (floor price) of the Government. PMB converts the paddy to rice either at its own mills or through private millers and markets the rice. For many years PMB adopted a low key role allowing the private sector to operate in the market; recently, however, the Government has provided capital to the PMB to play a more active role in the purchase of paddy from farmers.

The above constitute the principal agencies of government which provide support services to the farming community. There are other intermediate agencies such as banks (principally the Bank of Ceylon and the Peoples Bank, which are state owned), Cooperative Societies and Cooperative Rural banks (CRB which provide financial and marketing support. These agencies have branch offices in every principal town or village depending on the demand for services.

Given the increasing concern expressed about environmental factors related to or arising from irrigation schemes, other government agencies such as the Department of Fisheries, the Coast Conservation Department will have an important though indirect role in the management of irrigation schemes. Especially in Hambantota District where prawn fisheries in the lagoons at the lower reaches of the irrigation schemes are reported to have been affected by reduction of salinity levels due to excessive flow of drainage water and where sea outfalls get blocked by the formation of sandbars from time to time, close interaction with the DF and CCD becomes vital.

The Central Environment Authority (CEA) does not as yet have a Provincial or District office. Divisional Secretaries coordinate several functions on behalf of the CEA while local authorities such as Town Councils and Pradeshiya Sabha have been vested with authority to enforce some of the provisions of the Environment Law within their areas of authority. The District Secretary, Hambantota, however, has a District Environment Authority to monitor environmental projects supported by the Hambantota IRDP.

Hambantota IRDP supported by NORAD has been operating for nearly 15 years and has supported many minor irrigation projects as part of its development program.

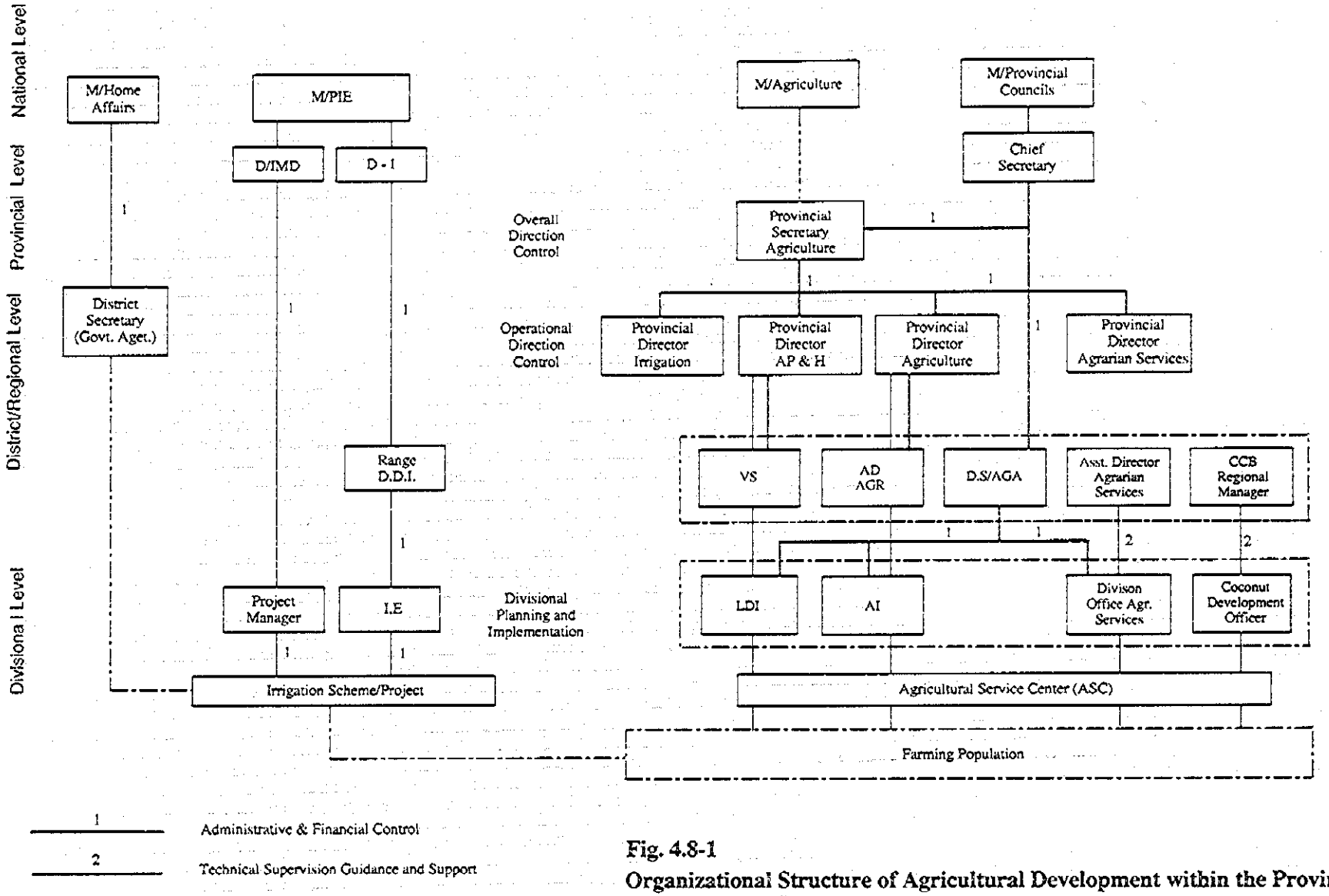


Fig. 4.8-1
Organizational Structure of Agricultural Development within the Province

CHAPTER FIVE:
PRESENT CONDITIONS OF STUDY AREAS

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5.1 Meteorology and Hydrology

(1) Scheme Area and River Basins

The 7 schemes under the Study lie in 7 basins of southern Sri Lanka. The following table indicates the relevant river basin and its catchment area for each scheme.

Table 5.1-1 Schemes and Their Relevant Basins and Basin Catchment Areas

Scheme	River Basin	Catchment Area (km2)
1 Liyangastota Scheme	Walawe Ganga	2,442
2 Badagiriya Scheme	Malala Oya	399
3 Kachigala Scheme	Kachchigala Ara	220
4 Muruthawela Reservoir Scheme	Urbokka Oya, Kirama Oya	348
5 Thangalu Welyaya Scheme	Kirama Oya	223
6 Polwatte Ganga Scheme	Polwatte Ganga	233
7 Benthara Ganga Right Bank Scheme	Welipenne Ganga	230
	(Benthara Ganga)	(622)

Source: Sri Lanka Atlas, Survey Department

(2) River Basin Description

The corresponding basins for the subject 7 schemes are described below.

a) Walawe Ganga Basin

The Walawe Ganga has its headwaters at the southern edge of the central uplands, flowing first to the east and then turning to the south at the point were the river enters the flat land. From here it flows on basically a straight course to the Indian Ocean. The river is a major one, having the largest catchment area in southern Sri Lanka (2,442 km²) and the 6th largest catchment in the nation.

Two large reservoirs are located on the Walawe Ganga at Samanalawela and Uda Walawe. Although the river is contingent to a part of the Wet Zone, the bulk of the river's catchment lies within Dry or Intermediate Zone. The river plays a particularly important role for agricultural development in the downstream Dry Zone area. Administratively, the river basin lies within the 3 provinces of Sabaragamuwa, Uva and Southern.

The benefit area of the Liyangastota scheme is supplied with irrigation water from the Liyangastota anicut and the Ridiyagama tank located about 20 km upstream from the river mouth. Two canals convey water to the benefit area, i.e. the Walawe LB and RB canals. The area supplied by the RB canal extends close to the left bank of the Kachigala Ara.
A hydrological map of the Walawe Ganga Basin is indicated in Fig. 5.1-1.

b) Malala Oya Basin

The Malala Oya basin is located on the eastern side of the Walawe Ganga Basin, sandwiched between the Walawe Ganga and Kirindi Oya basins. Catchment area is 399 km2. The headwaters of the river are in the mountainous area stretching to the east of the Uda Walawe tank from where the river passes Angunakolapelessa, flows south through Badagiriya tank and on through Malala lagoon into the Indian Ocean. The entire basin is within Dry Zone and has annual rainfall of around 1,000~1,500 mm/year.

The benefit area under the Badagiriya scheme extends downstream of Badagiriya tank. Due to its Dry Zone climate, water shortage occurs during the dry season and irrigation water is supplemented from Lunugamwehera reservoir on the Kirindi Oya.

The Bundala bird sanctuary is located at the downstream side of the benefit area.

A hydrological map of the Malala Oya Basin is indicated in Fig. 5.1-2.

c) Kachigala Ara Basin

Catchment area of the Kachigala Ara basin is 220 km2, and is located adjacent to the Walawe Ganga basin at its most downstream reaches. The headwaters of the Kachigala Ara are in the mountainous area on the south side of Hulando Oya Wewa, a tributary of the Walawe Ganga. The river flows south, essentially parallel to the Walawe Ganga, to empty into Kalametiya lagoon. Kalametiya lagoon connects to the Indian Ocean.

In recent years, irrigation water has been supplied to the farm land in the upstream area of the Kachigala Ara basin by means of the Uda Walawe RB main channel from Chaudrica tank under the Uda Walawe Project. Irrigation is carried out during the dry season as well, resulting in a perennial high moisture content of soil with rapid and large runoff occurring following rainfall. As a result, saline concentration of the water in Kalametiya lagoon has dropped, adversely impacting on fishery in the lagoon.

The benefit area of the Kachigala Ara Scheme lies at the downstream reaches of the river, and is irrigated via discharged diverted from the anicut on the river. A hydrological map of the Kachigala Ara basin is shown in Fig. 5.1-1.

d) Urubokka Oya Basin

The Urubokka Oya basin is located at the southern side of the western wing of the Walawe Ganga basin. The northern half of the Urubokka Oya basin is adjacent to the Walawe Ganga basin, while the southern half is contingent to the Kachigala Ara basin. Catchment area of the basin is 348 km2.

The subject basin includes an area that has undergone basin transformation due to construction of a dam on the Urubokka Ganga, a tributary of the Nilwaya Ganga, and the Urubokka Oya flows in a south-easterly direction through Muruthawela tank into Kahanda lagoon and ultimately into the Indian Ocean. Basin shape is long and narrow, with a southeast running axis.
The benefit area of the Muruthawela Scheme extends downstream of Muruthawela tank and Udukiriwela Wewa, and is divided into that area along the Urubokka Oya and that area lying

along the Kirama Oya. A hydrological map of the Urubokka Oya basin is shown in Fig. 5.1-3.

e) Kirama Oya Basin

The Kirama Oya basin is immediately to the west of the Urubokka Oya basin, and has a catchment area of 223 km^2. Kirama Oya has its headwaters upstream of Kirama tank, and is fed by the Maha Ela (headwaters above Denagama tank) at its middle reaches. The Kirama Oya then flows southeast, passing Tangalla town to finally empty into the Indian Ocean.

Anicuts are located at 18 sites on the Kirama Oya, of which 16 are included under the Muruthawela Reservoir Scheme. Area at the downstream reaches of the river suffers from poor drainage due to blockage of the river mouth, and improvement of this situation under the Tangalu Welyaya Scheme is highly desirable. A hydrological map of the Kirama Oya basin is shown in Fig. 5.1-3.

f) Polwatte Ganga Basin

The Polwatte Ganga basin is located at the southern side of the Gin Ganga basin, adjacent to the Nilwale Ganga basin to the east. The Gin Ganga basin and the Nilwale Ganga basin are sites of pump drainage projects undertaken with assistance from China and France, respectively. Catchment area of the Polwatte Ganga basin is 233 km^2, and basin shape is long and narrow, with a southeast running axis.

The river has its headwaters in the mountainous area adjacent to the Nilwale and Gin gangas, from where it flows southeast into Weligama bay (Indian Ocean). Since ground elevation is somewhat high in the vicinity of river mouth, the river meanders with resultant loss of discharge passing capacity. This causes poor drainage in lowland areas on the inland side, and inundation during flooding occurs.

The Polwatte Ganga Scheme is a drainage improvement project, and the schemes benefit area suffers from the above described inundation during flooding. A hydrological map of the Polwatte Ganga basin is shown in Fig. 5.1-4.

g) Welipenne Ganga Basin

The Welipenne Ganga is a tributary of the Benthara Ganga. Catchment area of the Welipenne Ganga is 230 km^2, while that of the Benthara Ganga is 622 km^2. The Benthara Ganga has its headwaters near Talgaswela adjacent to the Gin Ganga, flows north to the vicinity of Pitigama where the river then changes its course to the west to empty into the Indian Ocean at Bentota. The Welipenne Ganga has its headwaters in the mountainous zone near Iddagoda, adjacent to Kaluganga, from where it flow south to join with the Benthara Ganga roughly 8 km upstream from its mouth. The area at this point of confluence is lowland with elevation around 0.3~0.6 m, equivalent to high tidal water level.

The headwater area of the river is one of the most heavy-rain zones in the country, with annual rainfall of 5,000~6,000 mm. Although flood survey data is unavailable at present, it appears that lowland areas along the river are inundated 3~4 times per year. A hydrological map of the Welipenne Ganga basin is shown in Fig. 5.1-5

(3) Climate

a) Location of Meteorological Stations, and Available Data

Except for rainfall, weather observation stations with records on temperature, humidity and other weather data are limited. Meteorological stations in and around the Study region including the scheme basins pertain to those of the Weather Department at Colombo, Galle, Hambantota, Ratnapura, Badulla and Bandarawella, as well as gauging facilities at the Agricultural Research Station at Angunukolapelassa (Agricultural Department) and the Sugar Research Institute at Embilitpitiya (Agricultural Department). The locations of these stations are indicated in Fig. 5.1-6.

Data available at each station is indicated in the table below.

Table 5.1-2 Available Meteorological Data

Station / Item	Colombo	Galle	Hambantota	Ratnapura	Badulla	Bandarawella
Temperature	Jan '45 - Dec '94	Jan '45 - Dec '94	Jan '51 - Dec '94	Jan '45 - Dec '94	Jan '45 - Dec '94	--
Humidity	Jan '75 - Dec '94	Dec '75 - Dec '94	Dec '75 - Dec '94	Dec '75 - Dec '94	Dec '75 - Dec '94	Dec '75 - Dec '94
Evaporation	Jan '76 - Dec '94	--	--	Oct '75 - Dec '92	--	--
Wind Velocity	Jan '75 - Dec '94	Jan '75 - Dec '94	Jan '75 - Dec '94	Jan '93 - Dec '94	Jan '75 - Dec '94	Jan '75 - Dec '94
Sunshine Hours	Jan '75 - Dec '94	--	--	Oct '75 - Dec '92	--	--

b) Location of Rainfall Gauging Stations and Available Data

Over 80 rainfall gauging stations are located in and around the Study region including the scheme basins. Among these are stations which commenced record keeping in 1900. Of the total rainfall gauging stations in the region, data from 49 locations was selected as necessary for hydrological analysis. From these stations, rainfall records for the past 50 years were selected. A list of these selected gauging stations and their locations are shown in Table 5.1-3 and Fig. 5.1-6.

Data availability at each selected station for the past 50 years is shown in Table 5.1-3.

c) Temperature, Humidity and Other Factors

Relevant data from the meteorological stations in the region with regards to temperature, humidity, etc. are shown in Table 5.1-4.

Table 5.1-4 Summary of Climate Condition of Target Areas

Station / Item	Temperature (℃)	Humidity (%)	Evaporation (km/hr.)	Wind Velocity (hr.)	Sunshine Hours (mm/y)	Rainfall (mm/y)
Colombo	27.3	75.3	1,489.0	4.8	2,663.1	2,527.0 <3
Galle	26.7	80.2	---	8.0	---	2,472.0 <3
Hambantota	27.3	75.5	---	18.6	---	1,025.0
Ratnapura	27.4	76.0	1,470.9	4.2	2,126.5	3,740.0 <3
Badulla	23.5	69.9	---	0.6	---	1,803.0 <3
Bandarawella	20.3 <2	70.9	---	3.1	---	1,661.0 <3
AR <1	27.6	79.6	1,799.3	4.7	2,563.7	921.8
§RI <1	28.2	75.6	1,871.9	4.9	2,447.4	1,411.3

Notes≤1: Report on the F/S on Walawe Irrigation Upgrade and Extention Project, JICA , Jan. '93.
<2: Observed Data at Diyatala Station
<3: Hydrological Annual, Irrigation Department, 1992/93.

d) Rainfall

i) Monthly Rainfall

The Study areas range climatically from Dry Zone to Wet Zone. Rainfall in western parts of the region reach 5,000~6,000 mm/year while that in the eastern part are less than 1,000 mm/year. Monthly mean rainfall for each gauging station is shown in Table 5.1-5.

ii) Maximum Rainfall

Table 5.1-6 shows average and maximum values for maximum daily rainfall, maximum 3 day rainfall, maximum 5 day rainfall and annual rainfall, from the data at gauging stations with relevance to the drainage schemes under the Study.

iii) Probable Rainfall

Probable rainfall at each gauging station in a heavy rainfall year is shown in Table 5.1-7, and that in drought year at each said station is shown in Table 5.1-8. Probable rainfalls for maximum daily rainfall, maximum 3 day rainfall, and maximum 5 day rainfall at each of the gauging stations relevant to drainage schemes under the Study are given in Table 5.1-9.

iv) Areal Rainfall

On the basis of the probable rainfalls calculated in iii) above, areal rainfalls for the subject 7 basins are computed as shown in Table 5.1-10.

(4) River Flow

a) Location of River Gauging Stations

Although the Hydrological Section of the Irrigation Department carries out hydrological gauging island-wide, such gauging stations are of limited number in the Study areas. In addition, the MEA (Mahaweli Economic Agency) carries out river gauging on the Walawe

Ganga. Locations of gauging stations from which data was collected during the recent field survey under the Study are indicated in Figure 5.1-7.

b) Available Data

Stations and corresponding observation periods in the case of hydrological data collected during the recent field survey under the Study are indicated in the following table.

Table 5.1-11 Availability of Hydrological Data

No.	Gauging/ Measuring Site	River	Period	Remarks
1	Samarawewa	Walawe Ganga	Sep. 1959 - Mar '87	Daily Mean Discharge
2	Embilipitiya <1	Walawe Ganga	1960- 1990	Monthly Mean Discharge
3	Liyangastota <1	Walawe Ganga	1960- 1990	Monthly Inflow
4	Muruthawela <2	Urubokka Oya	1950- 1980	Monthly Inflow
5	Kirama Reg. D.Stream <2	Kirama Oya	1950- 1980	Monthly Inflow
6	Yakkalamulla	Polwatte Ganga	Feb. 1990 - Mar '91	Daily Discharge

<1: Report of F/S on Walawe Irrigation Upgrading and Extention Project, JICA, 1993.
<2: Report of Hydlorogical Study of Kirama Oya, Urubokka Oya and Muruthawela Reservoir, NORAD, 1984.

c) Runoff

Monthly mean runoff by gauging station is shown in the following table.

Table 5.1-12 Monthly Mean Runoff

(Unit : MCM)

Station	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Samanalawela (Walawe Ganga)	18.4	26.3	23.9	16.6	12.0	16.6	25.6	23.0	16.8	11.1	9.4	10.4	210.0
Liyangastota <1 (Walawe Ganga)	46.3	80.8	64.6	59.9	36.6	53.5	95.0	75.9	39.7	33.8	19.2	12.0	617.1
Murthawela <2 (Urubokka Oya)	8.7	6.0	10.5	8.5	9.9	6.6	7.4	7.8	3.3	11.9	17.5	20.0	118.1
Kirama <2 (Kirama Oya)	0.8	0.7	0.9	1.0	1.1	0.9	0.7	0.7	0.9	1.2	1.4	1.1	11.5

<1: Report of F/S on Walawe Irrigation Upgrading and Extention Project, JICA, 1993.
<2: Report of Hydlorogical Study of Kirama Oya, Urubokka Oya and Muruthawela Reservoir, NORAD, 1984.

Although gauging data (by the Irrigation Department) for discharge over the period February 1990 ~ March 1991 is available at Yakkalamulla on the Polwatte Ganga, it does not provide a basis for calculating high water level discharge (during flooding), and was accordingly not included.

d) Floods

There are no data, records and investigation reports regarding the floods in the study area. Judging from the available rainfall data for last 50 years (consecutive 5 days rainfall), heavy

rainfalls in Benthara Ganga Basin which is located in the wet zone usually occur at the beginning of south-west monsoon season (Yala), while in Kirama Oya Basin which is located in the dry zone, they occur at the beginning of north-eastern monsoon season (Maha). Heavy rainfalls in Polwatte Ganga Basin tend to occur mainly in the transition period of Maha and Yala season, although they have a tendency to rather concentrate in south-west monsoon. Judging from the said rainfall data, it is considered that big floods occurred 4 times in Benhara Ganga Basin, namely in 1962, 1963, 1968 and 1978, however, other than these,big floods have not been observed in the said basin.

While in Polwatte Ganga Basin, big floods were observed 5 times, namely, in 1962, 1963, 1968 and 1970. In Kirama Oya big flood was observed in December, 1969, however, other than this,
no big floods have not been observed in the said basin. The type of flood in Kirama Oya Basin can be classified into non-calamitous one, namely flooding level increases gradually without causing much damages to farmlands, houses, human life and domestic animals.

Present flood condition observed in Benthara Ganga Scheme, Polwatte Ganga Scheme and Kirama Oya Scheme are described below.

d)-1 Benthara Ganga Scheme

The survey results for flood condition in the scheme have revealed the following.

i) At Mahagoda Ferry Site of Benthara Ganga
- Ground Level of Bund :Appr. +0.49m (+1.6 ft)
- F.W.L in May, 1994's flood : Appr. +1.19m (+3.9 ft)
- H.F.W.L. : Appr. +2.50m (+8.2 ft)

ii) At Andawela Ferry Site of Welipenne Ganga
- Ground Level of Bund : Appr. +0.46m (+1.5 ft)
- F.W.L. : Appr. +2.59m (+8.5 ft)
- F.W.L. in May , 1963's flood : Appr. +3.96m (+13.0 ft)

iii) At Munamalwatta Bridge of Welipenne Ganga of Alutgama - Horaata Road
- Road Surface Level 60m away from the Bridge (Horawata Side)
: Appr. +2.32m (+7.6 ft)
- Vehicle are sometimes troubled in passing this road due to overflowing during floods.
- F.W.L. does not reach the Beam of Bridge, it rises up to Appr. +2.3m.
- Floods occur usually 4 times a year and flood water innurates for about 2 weeks.

The said floods may be analyzed as below:

i) Run-off and flood water level of Benthara Ganga are as follows;

- for the probable 2 years rainfall (321.9mm)
Run-off : 1,101.4 m^3/sec (1.77 m^3/sec/km^2)
Flood Water Level : +1.22m (+4.0 ft)
- for the probable 10 years rainfall (443.2mm)
Run-off : 1,614.9 m^3/sec (2.60 m^3/sec/km^2)
F.W.L : +1.87m (+6.14 ft)

- for the probable 20 years rainfall (489.6mm)
  Run-off : 1,857.8 m³/sec (2.91 m³/sec/km²)
  Flood Water Level : +2.18m (+7.16 ft)

ii) The Rainfall (5 days) in May, 1994's flood was 310mm, equivalent to the probable 2 years rainfall.

iii) Regarding the flood in May, 1963, Sirikandura Estate Gauging Station observed rainfalls of 776.2mm, equivalent to the probable 200 years rainfall.
Accordingly, F.W.L. in May, 1963 is estimated to have risen remarkably.

iv) From the above study, it is considered that the floods which exceed the level of 1.20m in MSL occur frequently.

Elevations of the low land areas of the Benthara Ganga R.B. Scheme are +0.15~0.46m MSL (+0.5~1.5ft). The sea levels at the Benthara Ganga River Mouth are as follows;

- Mean Sea Water Level: +0.48 m
- Mean H.W.L. : +0.91 m
- Mean L.W. L. : +0.11 m

These figures suggest that there exist some areas in Benthara Ganga Scheme which are lower than MSL, which cannot be drained well.

d)-2 Polwatte Ganga

There are no river gauging stations in the Basin and also no reports on the floods. The measured river discharge data are available only for about one year at Yakkalamulla. But these data are useful only for the study of irrigation water analysis, accordingly, the discharge during floods could not be estimated.

The results of field investigation in the study ares of Polwatte Ganga Scheme are as follows:

i) At Ilwatta Anicut Site

- Elevation of top of spillway : +1.06m (+3.5 ft)
- F.W.L. (Normal) : +1.37m (+4.5 ft)
- H.F.W.L.(1963) : +1.83m (+6.0 ft)

Approximate estimation of run-off of the Polwatte Ganga from the rainfall data is as follows;

- for probable 2 years rainfall (242.7 mm)
  Run-off : 279.9 m³/sec (1.28 m³/sec/km²)
- for probable 10 years rainfall (362.2 mm)
  Run-off : 439.4 m³/sec (2.02 m³/sec/km²)

The elevations of the low land area of Polwatte Ganga Scheme are approximately +0.15 ~ 0.37m (0.5 ~ 1.2 ft) MSL. The sea level of Weligama Bay is as follows;

- mean sea level : +0.43 m
- mean H.W.L. : +0.81 m
- mean L.W.L. : +0.09 m

Part of the area of Polwatte Ganga Scheme has land below the sea level and it is usually inundated and ill-drained.

d)-3 Kirama Oya

There is no river gauging stations in the Basin also no records and no investigation reports on the floods. NORAD measured the river discharge at the end of Kirama Tank Regulator during May, 1979 to August, 1982. This site is located far upstream of the River that the data are difficult to be used for the study, especially for the study of lower part of the river.

Approximate estimation of run-off of the Kirama Oya from the rainfall data is as follows;

- for probable 2 years rainfall (170.6 mm)
  Run-off : 215.3 m^3/sec (0.97 m^3/sec/km^2)
- for probable 10 years rainfall (362.2 mm)
  Run-off : 375.1 m^3/sec (1.68 m^3/sec/km^2)

There have been no heavy rainfalls except in Dec. 1969's flood in this Basin for last 50 years. Regarding the Dec. 1969's Flood, the 5 days rainfall during the flood was 450.8mm, equivalent to the probable 150~200 years rainfall. Irrigation Department conducted survey for the Flood Water Level of this Flood (NORAD Report). The report says that Flood Water Level at the end of Kirama Oya would have reached +4.61m (+15.15 ft) and this Water Level was almost the same level of top slab of Danketiya Anicut. The elevations of low land area of Tangalu Welyaya Scheme are appr. +0.27 ~ 0.43 m (+0.9~1.4 ft). The sea level at the river mouth of Kirama Oya is as follows;

- mean sea level : +0.37 m
- mean H.W.L. : +0.70 m
- mean L.W.L. : +0.08 m

Part of the area of the scheme is below the sea level and it is usually inundated and ill-drained.

(5) Tide - Sea Level

a) Location of Tidal Gauging Stations

There are no tidal gauging stations in the southern region at present (the former station at Galle is no longer in operation).

b) Tidal Water Level at Colombo

The average tidal water level at Colombo port is 0.5 m MSL (fluctuating from a high of 1.0 MSL to a low of 0.0 MSL. Monthly fluctuations in tidal water level are shown in the following table.

Table 5.1-14 Sea Level Observed at Colombo Port

(Unit : m)

Station	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Mean	0.45	0.57	0.61	0.57	0.55	0.55	0.54	0.51	0.48	0.39	0.41	0.41	0.50
Highest	1.00	1.12	1.15	1.11	1.04	1.07	1.10	1.12	0.98	0.89	1.06	0.97	1.05
Higest-Mean	0.92	1.03	1.05	0.99	0.95	0.98	1.03	0.98	0.90	0.81	0.85	0.85	0.95
Lowest	-0.03	0.03	0.09	0.13	0.11	0.10	0.00	-0.01	0.05	0.01	-0.04	-0.04	0.03
Losest-Mean	0.03	0.16	0.26	0.21	0.18	0.15	0.10	0.08	0.08	0.05	0.01	0.01	0.11

Data Period : Jan '81- Dec. '90

c) Tidal Water Level in the Southern Region

Under the Basic Design Study of the Project for Rehabilitation of the Kirinda Fisheries Harbor carried out by JICA in 1991, tidal elevation ratios and duration differentials were calculated among Colombo and major points in the southern region (Galle, Tangala, Hambantota). With reference to this data, tidal levels for the estuaries of Bentota Ganga, Polwalla Ganga and Kirama Oya were estimated as shown in the following table.

Table 5.1-15 Sea Level in Southern Region

	Colombo	Bentota G.	Galle	Polwatte G.	Kirama Oya	Hambantota
Time Diffence	0	-	+15 min.	-	+23 min.	+20 min.
Ratio of Tide Level	1	0.96	0.92	0.85	0.74	0.65
Highest Mean	+0.95	+0.91	-	+0.81	+0.7	-
MSL	+0.5	+0.48	-	+0.43	+0.37	-
Lowest Mean	+0.11	+0.11	-	+0.09	+0.08	-

Table 5.1-3 Available Rainfall Data

No.	STATION NAME	RECORDED PERIOD		LOCATION	
		Start	End	Latitude	Longitude
1	KALUTARA	Jan '45	Dec '94	6.67N	79.95E
2	ST.VINCENTS	Jan '55	Dec '94	6.52N	80.00E
3	SIRIKADURA ESTATE	Jan '45	Dec '94	6.50N	80.15E
4	PELAWATTE	Jan '59	Dec '94	6.42N	80.22E
5	BALAPITIYA	Jan '45	Sep '91	6.28N	80.05E
6	HORAGODA	Dec '54	Dec '94	6.50N	80.25E
7	GEEKIYANAKANDA	Jan '45	Dec '94	6.60N	80.12E
8	CHARLEY MOUNT ESTATE	Jan '45	Dec '94	6.00N	80.47E
9	THIHAGODA	Jan '45	Dec '94	6.00N	80.57E
10	HIYARE	Jan '45	Dec '94	6.07N	80.32E
11	BEAUSERSEJOUR	Jan '45	Dec '94	6.15N	80.33E
12	ARPTHORPE ESTATE	Jun '85	Dec '94	6.20N	80.32E
13	GOLUWAWATTE	Feb '65	Dec '94	6.10N	80.48E
14	MAPALANA	Jan '45	Dec '94	6.07N	80.57E
15	DANDENIYA TANK	Jan '45	Nov '93	6.00N	80.65E
16	ELLAWELA TANK	Jan '45	Dec '91	6.08N	80.60E
17	MAWARELLA ESTATE	Jan '45	Sep '94	6.20N	80.58E
18	KIRAMA	Jan '45	Sep '94	6.22N	80.67E
19	PANILKANDA	Jan '45	Sep '92	6.35N	80.63E
20	TANGALLA	Jan '45	Nov '94	6.02N	80.80E
21	BATAATA	Jan '45	Dec '94	6.10N	80.92E
22	UDUKIRIWELA	Jan '45	Jan '67	6.15N	80.77E
23	USWEWA	Jan '89	Dec '94	6.23N	80.92E
24	MAMADOLA	Jan '45	Dec '94	6.17N	80.98E
25	LIYANGAHATOTA	Jan '45	Dec '94	6.23N	80.95E
26	RIDIYAGAMA	Jan '45	Dec '94	6.22N	80.98E
27	SURIYAWEWA	Nov '64	Dec '94	6.32N	81.00E
28	EMBILIPITIYA TANK	Jan '45	May '93	6.33N	80.85E
29	GODAKAWELA	Jan '45	Dec '94	6.50N	80.65E
30	DEPEDENE GROUP	Jan '45	Dec '94	6.47N	80.55E
31	WELLANDURA ESTATE	Jan '55	Dec '94	6.53N	80.57E
32	MAHAWALATENNA	Jan '45	Jun '93	6.58N	80.75E
33	BALANGODA POST OFFICE	Jan '45	Nov '94	6.65N	80.70E
34	ALUPOLLA GROUP	Jan '45	Dec '94	6.72N	80.58E
35	NAGRAK ESTATE	Jan '45	Nov '94	6.77N	80.78E
36	MASKELIYA HOSPITAL	Jan '45	Oct '94	6.83N	80.57E
37	DIYATALAWA	Oct '90	Dec '94	6.82N	80.97E
38	HAKGALA BOTNICAL GARDEN	Nov '50	Nov '94	6.92N	80.82E
39	HAMBANTOTA	Jan '51	Dec '94	6.12N	81.13E
40	BADAGIRIYA TANK	Mar '55	Dec '94	6.23N	81.15E
41	BUNDALA LEWAYA	Jul '47	Dec '94	6.20N	81.25E
42	UDUWILA	Jan '45	Oct '91	6.25N	81.25E
43	LUNUGAMWEHERA	May '83	Dec '94	6.33N	81.20E
44	MAHAGALWEWA	Oct '90	Dec '94	6.38N	81.03E
45	HAMBEGAMUWA	Jan '45	Nov '94	6.53N	80.95E
46	MIGAHAJANDURA SCHEME	Jan '45	Feb '89	6.37N	81.03E
47	KATARAGAMA	Jan '89	Dec '94	6.42N	81.33E
48	PALATUPANA	Jan '45	Dec '94	6.25N	81.38E

Table 5.1-5 Monthly Mean Rainfall and Annual Total of each Rainfall Gauging Station

(unit : mm)

No. STATION	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	MAHA	YALA	ANNUAL
1 KALUTARA	410.5	326.9	206.4	96.5	68.8	139.8	288.7	368.4	244.3	174.4	138.9	257.4	1268.9	1472.1	2741.0
2 ST.VINCENTS	427.6	341.9	211.7	90.2	84.6	126.8	286.6	459.3	251.7	199.1	167.0	309.2	1282.8	1672.9	2955.7
3 SIRIKADURA ESTATE	514.8	416.4	277.7	139.1	133.6	258.6	392.5	558.1	393.9	312.2	259.5	381.6	1740.2	2297.8	4038.0
4 PELAWATTE	546.6	512.9	375.2	212.4	186.6	315.3	418.2	673.4	463.9	361.8	327.9	463.9	2149.0	2709.1	4858.1
5 BALAPITIYA	359.2	328.3	219.1	97.0	105.8	151.2	304.0	325.0	206.9	176.5	159.9	245.2	1260.6	1417.5	2678.1
6 HORAGODA	501.1	465.1	316.1	162.8	169.4	296.9	379.1	542.0	426.2	318.4	311.1	405.9	1911.4	2382.7	4294.1
7 GEEKIYANAKANDA	493.5	392.4	274.3	134.4	126.2	226.3	360.8	552.6	383.8	290.8	247.8	366.4	1647.1	2202.2	3849.3
8 CHARLEY MOUNT ESTATE	290.4	273.3	162.4	102.9	77.7	111.2	184.9	286.9	224.2	167.4	178.3	224.8	1017.9	1266.5	2284.4
9 THIHAGODA	278.6	257.7	135.2	81.0	58.5	95.9	143.4	258.3	207.1	166.6	175.9	189.0	906.9	1140.3	2047.2
10 HIYARE	393.5	307.2	193.5	115.5	116.4	160.8	215.1	374.0	269.7	216.6	225.4	292.7	1286.9	1593.5	2880.4
11 BEAUSERSEJOUR	382.4	362.7	242.6	156.1	154.6	208.2	266.5	370.3	311.7	226.1	229.7	298.3	1506.6	1702.6	3209.2
12 ARPTHORPE ESTATE	476.7	425.7	222.5	164.0	111.2	239.8	266.4	466.6	384.8	218.6	285.4	327.4	1639.9	1949.2	3589.1
13 GOLUWAWATTE	348.4	391.2	238.5	144.5	112.1	193.6	232.7	350.0	275.7	172.3	185.3	278.6	1428.3	1494.6	2922.9
14 MAPALANA	286.0	285.6	201.5	126.3	96.8	134.6	156.5	288.3	229.0	155.6	177.7	214.7	1130.8	1221.8	2352.6
15 DANDENIYA TANK	230.5	224.8	120.3	61.4	47.9	77.5	115.0	204.8	184.0	137.5	152.6	168.3	762.4	962.2	1724.6
16 ELLAWELA TANK	256.6	278.9	199.3	123.1	84.2	131.8	172.7	246.7	187.6	139.4	150.5	190.7	1073.9	1087.6	2161.5
17 MAWARELLA ESTATE	370.8	379.7	271.7	156.5	120.6	230.8	280.2	314.6	286.3	184.9	194.6	255.0	1530.1	1515.6	3045.7
18 KIRAMA	247.1	311.7	226.8	130.4	113.9	172.9	187.9	179.7	175.9	123.7	120.0	161.2	1202.8	948.4	2151.2
19 PANILKANDA	336.0	401.0	292.0	169.2	159.2	242.6	313.4	261.9	231.3	149.7	146.3	202.0	1600.0	1304.6	2904.6
20 TANGALLA	162.6	208.6	125.1	54.4	36.9	53.4	105.3	148.7	118.0	82.8	101.1	111.9	641.0	667.8	1308.8
21 BATAATA	141.2	194.6	115.5	58.1	45.6	59.8	89.3	103.8	78.9	57.8	59.8	74.6	614.8	464.2	1079.0
22 UDUKIRIWELA	162.3	202.8	155.9	107.6	66.6	136.7	132.1	119.6	97.6	75.2	68.5	100.5	831.9	593.5	1425.4
23 USWEWA	113.2	152.1	47.6	40.4	0.4	19.1	74.1	122.3	41.2	24.9	15.7	32.0	372.8	310.2	683.0
24 MAMADOLA	134.3	205.1	120.7	74.9	48.1	67.7	93.0	95.4	57.5	50.1	38.5	60.6	650.8	395.1	1045.9
25 LIYANGAHATOTA	177.7	234.7	167.0	85.9	55.3	88.5	127.5	94.5	60.6	42.2	34.7	44.4	809.1	403.9	1213.0
26 RIDIYAGAMA	144.5	203.3	149.2	76.3	53.0	67.1	107.3	81.0	51.0	45.6	35.2	51.3	693.4	371.4	1064.8
27 SURIYAWEWA	224.6	241.6	187.5	66.8	41.1	96.8	143.7	90.8	31.8	27.3	31.5	68.1	858.4	393.2	1251.6
28 EMBILIPITIYA TANK	194.1	260.9	158.9	78.0	62.0	126.3	159.3	108.4	47.8	52.2	42.2	68.1	880.2	478.0	1358.2
29 GODAKAWELA	241.1	295.4	193.9	101.4	90.2	198.2	229.1	165.9	143.7	110.2	98.3	130.9	1120.2	878.1	1998.3
30 DEPEDENE GROUP	420.1	406.2	249.0	142.5	124.2	230.4	310.1	395.4	374.3	256.2	248.6	321.8	1571.4	1906.4	3477.8
31 WELLANDURA ESTATE	266.2	318.0	188.7	113.3	104.8	187.7	224.2	267.7	276.0	203.8	183.5	215.0	1178.7	1370.2	2548.9
32 MAHAWALATENNA	169.3	441.6	225.9	130.8	108.7	237.9	263.3	83.1	82.2	60.4	60.0	80.3	1314.2	629.3	1943.5
33 BALANGODA POST OFFICE	250.0	396.6	229.4	129.6	117.0	223.7	314.3	193.1	151.4	92.5	87.2	126.2	1346.3	964.7	2311.0
34 ALUPOLLA GROUP	515.6	467.4	325.5	184.2	175.3	280.3	330.2	495.6	445.8	327.3	334.2	400.3	1948.3	2393.4	4341.7
35 NAGRAK ESTATE	376.5	411.9	238.4	127.3	115.8	237.0	411.0	198.1	107.2	96.4	88.9	130.0	1506.9	1031.6	2538.5
36 MASKELIYA HOSPITAL	303.9	251.9	143.5	71.2	74.5	170.5	257.3	307.7	377.2	294.7	239.2	250.5	1013.5	1726.6	2740.1
37 DIYATALAWA	222.6	284.1	175.9	175.4	61.2	61.1	106.8	109.5	28.7	62.9	35.3	187.2	980.3	530.4	1510.7
38 HAKGALA BOTNICAL GARDEN	269.6	252.2	251.7	203.0	128.2	99.4	193.1	153.7	130.8	121.1	97.2	134.6	1204.1	830.5	2034.6
39 HAMBANTOTA	138.8	180.8	117.4	77.0	48.6	61.6	90.5	85.7	58.2	51.2	50.1	65.1	624.2	400.8	1025.0
40 BADAGIRIYA TANK	177.2	149.2	43.5	42.9	44.5	80.2	70.7	31.1	26.4	34.4	42.4	140.0	537.5	345.0	882.5
41 BUNDALA EWAYA	121.1	186.8	137.3	136.3	51.6	50.3	83.6	63.9	39.4	57.0	23.9	35.6	683.4	303.4	986.8
42 UDUWILA	141.1	202.7	120.8	91.4	52.2	67.0	84.2	53.1	23.6	28.9	20.9	29.8	675.2	240.5	915.7
43 LUNUGAMWEHERA	174.7	208.2	163.2	65.7	29.1	79.8	110.7	58.1	29.1	43.7	21.7	83.1	720.7	346.4	1067.1
44 MAHAGALWEWA	132.4	295.6	202.9	64.7	32.3	63.9	111.4	102.9	27.6	26.2	10.5	77.4	791.8	356.0	1147.8
45 HAMBEGAMUWA	201.5	303.3	150.5	86.8	71.5	159.6	239.0	80.7	19.6	31.7	25.7	50.4	973.2	447.1	1420.3
46 MIGAHAJANDURA SCHEME	209.4	249.7	148.5	84.3	54.6	114.2	164.8	84.5	34.5	37.9	21.5	45.3	860.7	388.5	1249.2
47 KATARAGAMA	200.0	282.1	187.3	49.8	12.9	64.2	71.1	52.6	14.9	13.2	16.2	91.8	796.3	259.8	1056.1
48 PALATUPANA	135.7	198.1	155.4	104.7	63.3	69.9	79.3	47.1	28.5	29.9	20.7	27.7	727.1	233.2	960.3
49 BLACKWOOD	389.8	479.7	264.3	141.1	142.8	227.9	413.3	152.0	23.5	75.7	72.2	121.0	1645.6	857.7	2503.3

Table 5.1-6 Max. Daily Rainfall, Max. 3days Rainfall and Max. 5days Rainfall

(Unit : mm)

No.	Station	Daily		3 Days		5 Days		Annual	
		Mean	Max	Mean	Max	Mean	Max	Mean	Max
1	KALUTARA	134.5	270.0	229.6	442.3	282.9	589.4	2,741.0	4,446.2
2	ST.VINCENTS GROUP	161.2	264.2	273.5	456.5	325.4	524.4	2,955.7	3,968.6
3	SIRIKANDURA ESTATE	164.0	263.4	265.2	542.7	338.3	776.2	4,038.0	5,701.3
4	PELAWATTE	165.2	321.2	276.3	487.2	363.8	568.0	4,858.1	6,512.9
5	BALAPITIYA	137.3	279.4	222.6	404.7	279.7	508.0	2,678.1	3,828.0
6	HORAGODA ESTATE	115.5	240.0	217.9	421.8	292.6	559.1	4,294.1	6,768.4
7	GEEKIYANAKANDA	165.9	360.6	277.0	462.6	342.3	631.5	3,849.3	5,023.3
8	CHARLEY MOUNT ESTATE	124.4	296.1	186.5	544.9	224.8	592.3	2,284.4	3,218.6
9	THIHAGODA	114.6	203.2	170.4	318.3	206.5	469.7	2,047.2	3,870.3
10	HIYARE	142.0	274.3	220.3	435.2	275.7	713.5	2,880.4	4,080.3
11	BEAUSERSEJOUR	135.4	243.5	211.6	324.8	262.5	467.4	3,209.2	4,751.3
12	ARPTHORPE ESTATE	136.4	162.0	220.9	329.2	269.4	387.9	3,589.1	4,548.6
13	GOLUWAWATTA	132.7	280.1	219.3	423.8	271.1	479.8	2,922.9	3,703.4
15	DANDENIYA TANK	111.6	279.4	173.8	469.8	208.7	489.6	2,352.6	2,658.4
16	ELLAWELLA TANK	110.0	246.1	162.5	379.9	195.8	429.6	1,724.6	3,978.4
18	KIRAMA	106.8	275.0	163.6	410.2	205.2	464.9	2,161.5	2,926.6
20	TANGALLA	98.9	419.1	138.3	563.8	158.0	591.5	1,308.8	3,727.8
22	UDUKIRIWILA	82.3	113.2	116.1	169.2	151.5	297.4	1,425.4	2,054.0

Table 5.1-7 Probable Annual Rainfall at Each Rainfall Gauging Station / Flood Year

(Unit : mm/year)

No. Station	Return Period (years)							
	2	5	10	20	30	50	100	200
1 KALUTARA	2,649.6	3,141.5	3,467.1	3,779.5	3,959.2	4,183.8	4,486.8	4,788.7
2 ST.VINCENTS	2,880.0	3,286.6	3,555.9	3,814.1	3,962.7	4,148.4	4,398.9	4,648.5
3 SIRIKADURA ESTATE	3,926.2	4,528.2	4,926.7	5,309.0	5,528.9	5,803.8	6,174.6	6,544.0
4 PELAWATTE	4,747.1	5,344.7	5,740.3	6,119.8	6,338.1	6,611.0	6,979.1	7,345.8
5 BALAPITIYA	2,603.3	3,006.2	3,273.1	3,529.0	3,676.2	3,860.2	4,108.5	4,355.8
6 HORAGODA	4,130.4	5,010.6	5,593.4	6,152.4	6,474.0	6,876.0	7,418.2	7,958.4
7 GEEKIYANAKANDA	3,760.0	4,241.0	4,559.5	4,864.9	5,040.7	5,260.4	5,556.7	5,851.9
8 CHARLEY MOUNT ESTATE	2,216.3	2,582.4	2,824.8	3,057.4	3,191.1	3,358.3	3,583.9	3,808.6
9 THIHAGODA	1,847.6	2,321.5	2,635.2	2,936.1	3,109.2	3,325.6	3,617.5	3,908.3
10 HIYARE	2,786.8	3,290.5	3,624.0	3,943.8	4,127.9	4,357.9	4,668.2	4,977.3
11 BEAUSERSEJOUR	3,105.1	3,664.6	4,035.0	4,390.3	4,594.7	4,850.3	5,194.9	5,538.3
12 ARPTHORPE ESTATE	3,504.8	3,958.2	4,258.4	4,546.4	4,712.1	4,919.1	5,198.5	5,476.7
13 GOLUWAWATTE	2,855.5	3,218.5	3,458.9	3,689.5	3,822.1	3,987.9	4,211.6	4,434.4
14 MAPALANA	2,287.4	2,638.9	2,871.6	3,094.8	3,223.2	3,383.7	3,600.2	3,815.9
15 DANDENIYA TANK	1,653.4	2,036.7	2,290.4	2,533.8	2,673.9	2,848.9	3,085.0	3,320.2
16 ELLAWELA TANK	2,071.7	2,554.4	2,873.9	3,180.5	3,356.8	3,577.2	3,874.5	4,170.8
17 MAWARELLA ESTATE	2,964.5	3,401.9	3,691.4	3,969.2	4,129.0	4,328.7	4,598.1	4,866.6
18 KIRAMA	2,074.7	2,486.4	2,758.9	3,020.3	3,170.7	3,358.7	3,612.3	3,865.0
19 PANILKANDA	2,836.8	3,201.0	3,442.1	3,673.3	3,806.3	3,972.6	4,196.9	4,420.4
20 TANGALLA	1,240.6	1,607.7	1,850.8	2,084.0	2,218.2	2,385.9	2,612.0	2,837.4
21 BATAATA	1,035.9	1,267.5	1,420.7	1,567.8	1,652.4	1,758.1	1,900.7	2,042.8
22 UDUKIRIWELA	1,380.6	1,621.1	1,780.2	1,932.9	2,020.8	2,130.6	2,278.7	2,426.3
23 USWEWA	664.3	764.0	830.0	893.3	929.7	975.2	1,036.6	1,097.8
24 MAMADOLA	1,003.2	1,233.1	1,385.2	1,531.2	1,615.2	1,720.2	1,861.8	2,002.8
25 LIYANGAHATOTA	1,167.0	1,413.9	1,577.4	1,734.2	1,824.4	1,937.2	2,089.3	2,240.9
26 RIDIYAGAMA	1,026.9	1,230.6	1,365.5	1,494.9	1,569.4	1,662.5	1,788.0	1,913.0
27 SURIYAWEWA	1,209.2	1,437.9	1,589.3	1,734.6	1,818.1	1,922.6	2,063.5	2,203.8
28 EMBILIPITIYA TANK	1,316.0	1,543.5	1,694.2	1,838.7	1,921.8	2,025.7	2,165.9	2,305.6
29 GODAKAWELA	1,947.3	2,222.0	2,403.8	2,578.3	2,678.7	2,804.1	2,973.3	3,141.9
30 DEPEDENE GROUP	3,376.0	3,923.6	4,286.1	4,633.9	4,833.9	5,084.0	5,421.3	5,757.3
31 WELLANDURA ESTATE	2,495.1	2,783.8	2,975.0	3,158.3	3,263.8	3,395.7	3,573.5	3,750.8
32 MAHAWALATENNA	1,869.4	2,268.0	2,532.0	2,785.1	2,930.8	3,112.8	3,358.4	3,603.1
33 BALANGODA POST OFFICE	2,241.8	2,613.4	2,859.3	3,095.3	3,231.0	3,400.7	3,629.6	3,857.6
34 ALUPOLLA GROUP	4,188.2	5,013.9	5,560.3	6,084.6	6,386.2	6,763.3	7,271.8	7,778.5
35 NAGRAK ESTATE	2,436.2	2,987.4	3,352.3	3,702.4	3,903.8	4,155.5	4,495.0	4,833.3
36 MASKELIYA HOSPITAL	2,658.9	3,096.0	3,385.3	3,662.9	3,822.6	4,022.2	4,291.5	4,559.7
37 DIYATALAWA	1,460.6	1,729.6	1,907.7	2,078.5	2,176.8	2,299.7	2,465.4	2,630.5
38 HAKGALA BOTNICAL GARDEN	1,962.5	2,350.2	2,606.8	2,853.0	2,994.6	3,171.6	3,410.4	3,648.3
39 HAMBANTOTA	982.1	1,213.8	1,367.2	1,514.3	1,599.0	1,704.8	1,847.5	1,989.7
40 BADAGIRIYA TANK	828.4	1,119.2	1,311.7	1,496.4	1,602.7	1,735.5	1,914.6	2,093.1
41 BUNDALA LEWAYA	945.7	1,167.3	1,314.0	1,454.7	1,535.6	1,636.8	1,773.3	1,909.3
42 UDUWILA	868.2	1,122.7	1,291.2	1,452.8	1,545.8	1,662.1	1,818.8	1,975.0
43 LUNUGAMWEHERA	1,032.1	1,219.9	1,344.3	1,463.6	1,532.3	1,618.0	1,733.8	1,849.1
44 MAHAGALWEWA	1,107.7	1,322.7	1,465.1	1,601.6	1,680.1	1,778.3	1,910.8	2,042.7
45 HAMBEGAMUWA	1,354.0	1,710.7	1,946.9	2,173.4	2,303.7	2,466.6	2,686.3	2,905.2
46 MIGAHAJANDURA SCHEME	1,206.1	1,437.2	1,590.2	1,737.0	1,821.4	1,927.0	2,069.3	2,211.1
47 KATARAGAMA	1,022.4	1,203.7	1,323.7	1,438.9	1,505.1	1,587.9	1,699.6	1,810.8
48 PALATUPANA	917.8	1,146.6	1,298.1	1,443.5	1,527.1	1,631.6	1,772.6	1,913.1
49 BLACKWOOD	2,420.6	2,865.7	3,160.4	3,443.0	3,605.6	3,808.9	4,083.1	4,356.3

Table 5.1-8 Probable Annual Rainfall at Each Rainfall Gauging Station / Drought Year

(Unit : mm/year)

No. Station	Return Period (years)							
	2	5	10	20	30	50	100	200
1 KALUTARA	2,700.3	2,262.8	2,055.1	1,893.7	1,813.1	1,722.2	1,613.6	1,518.0
2 ST.VINCENTS	2,938.3	2,561.4	2,373.8	2,223.5	2,146.9	2,059.2	1,952.5	1,856.7
3 SIRIKADURA ESTATE	3,982.0	3,450.5	3,201.2	3,008.9	2,913.3	2,805.9	2,678.2	2,566.3
4 PELAWATTE	4,839.7	4,284.9	4,005.2	3,779.3	3,663.6	3,530.5	3,367.8	3,221.0
5 BALAPITIYA	2,648.5	2,282.7	2,107.1	1,969.7	1,900.8	1,822.8	1,729.1	1,646.4
6 HORAGODA	4,224.7	3,407.2	3,016.9	2,712.4	2,559.9	2,387.7	2,181.4	1,999.5
7 GEEKIYANAKANDA	3,812.3	3,379.3	3,172.1	3,010.3	2,929.3	2,837.7	2,727.9	2,630.9
8 CHARLEY MOUNT ESTATE	2,273.9	1,926.6	1,750.9	1,608.7	1,535.7	1,451.7	1,348.9	1,256.0
9 THIHAGODA	1,898.4	1,480.3	1,281.0	1,125.6	1,047.9	960.2	855.2	762.6
10 HIYARE	2,856.0	2,388.5	2,157.5	1,973.1	1,879.5	1,772.5	1,642.6	1,526.4
11 BEAUSERSEJOUR	3,196.4	2,677.0	2,412.1	2,196.6	2,085.7	1,957.7	1,800.5	1,658.0
12 ARPTHORPE ESTATE	3,545.4	3,118.0	2,919.4	2,767.0	2,691.6	2,607.1	2,507.0	2,419.6
13 GOLUWAWATTE	2,910.3	2,564.7	2,391.2	2,251.5	2,180.1	2,098.2	1,998.1	1,908.0
14 MAPALANA	2,315.1	2,009.4	1,868.4	1,760.7	1,707.6	1,648.2	1,578.1	1,517.0
15 DANDENIYA TANK	1,700.9	1,350.1	1,179.5	1,044.7	976.7	899.5	806.2	723.4
16 ELLAWELA TANK	2,121.3	1,702.5	1,504.0	1,349.7	1,272.7	1,185.9	1,082.1	990.9
17 MAWARELLA ESTATE	3,044.4	2,383.9	2,039.9	1,756.4	1,609.1	1,437.9	1,226.1	1,032.5
18 KIRAMA	2,114.6	1,726.0	1,542.5	1,400.2	1,329.4	1,249.5	1,154.3	1,070.7
19 PANILKANDA	2,887.5	2,549.2	2,381.6	2,247.9	2,179.8	2,102.1	2,007.6	1,923.1
20 TANGALLA	1,275.0	1,033.3	921.3	835.4	793.0	745.5	689.3	640.2
21 BATAATA	1,060.5	850.5	750.4	672.3	633.3	589.2	536.4	489.9
22 UDUKIRIWELA	1,414.7	1,189.7	1,077.9	988.5	943.0	890.9	827.6	770.9
24 MAMADOLA	1,034.4	817.6	710.6	625.3	582.0	532.5	472.6	418.9
25 LIYANGAHATOTA	1,203.5	973.5	858.4	766.0	718.8	664.6	598.6	539.3
26 RIDIYAGAMA	1,052.1	863.5	771.7	699.2	662.6	621.0	570.9	526.2
27 SURIYAWEWA	1,224.5	1,025.2	934.8	866.4	832.9	795.7	751.9	714.1
28 EMBILIPITIYA TANK	1,340.5	1,134.4	1,035.9	959.1	920.6	877.1	825.0	779.0
29 GODAKAWELA	1,982.8	1,728.4	1,603.8	1,505.0	1,455.0	1,398.0	1,329.2	1,267.8
30 DEPEDENE GROUP	3,475.1	3,475.1	3,475.1	3,475.1	3,475.1	3,475.1	3,475.1	3,475.1
31 WELLANDURA ESTATE	2,545.4	2,274.0	2,133.8	2,019.0	1,959.6	1,890.8	1,805.8	1,728.5
32 MAHAWALATENNA	1,936.1	1,526.6	1,317.2	1,146.6	1,058.7	957.2	832.4	719.2
33 BALANGODA POST OFFICE	2,303.5	1,945.3	1,762.4	1,613.5	1,536.8	1,448.3	1,339.6	1,240.9
34 ALUPOLLA GROUP	4,181.9	3,561.5	3,305.7	3,123.5	3,037.8	2,945.4	2,840.7	2,753.6
35 NAGRAK ESTATE	2,463.7	1,997.3	1,789.6	1,634.4	1,559.0	1,475.6	1,378.3	1,294.9
36 MASKELIYA HOSPITAL	2,676.9	2,279.8	2,103.9	1,973.0	1,909.5	1,839.5	1,758.1	1,688.3
38 HAKGALA BOTNICAL GARDEN	2,003.4	1,652.9	1,486.0	1,355.9	1,290.9	1,217.5	1,129.7	1,052.3
39 HAMBANTOTA	1,020.6	800.4	688.0	596.4	549.3	494.8	427.9	367.2
40 BADAGIRIYA TANK	851.3	598.6	482.1	393.1	349.3	300.2	242.3	191.9
41 BUNDALA LEWAYA	962.3	765.1	674.7	605.8	571.9	534.1	489.5	450.7
42 UDUWILA	888.2	664.2	560.9	482.0	443.0	399.5	348.1	303.4
43 LUNUGAMWEHERA	1,042.1	881.7	810.6	757.6	731.9	703.5	670.4	642.2
45 HAMBEGAMUWA	1,408.1	1,070.1	900.2	763.4	693.3	613.0	514.8	426.3
46 MIGAHAJANDURA SCHEME	1,233.3	1,014.7	909.1	826.0	784.3	736.9	679.8	629.3
47 KATARAGAMA	1,054.1	870.0	775.1	697.4	657.2	610.7	553.3	501.1
48 PALATUPANA	927.8	739.5	656.3	594.6	564.7	531.7	493.4	460.7
49 BLACKWOOD	2,485.8	2,069.6	1,861.7	1,694.8	1,609.7	1,512.1	1,393.2	1,286.3

Table 5.1-9 Probable Max. Daily Rainfall, Max. 3days Rainfall and Max. 5days Rainfall

Maximum Daily Rainfall

(Unit : mm)

No.	Station	Return Period (Years)							
		2	5	10	20	30	50	100	200
1	Kalutara	126.5	169.8	198.4	225.9	241.7	261.5	288.1	314.7
2	St.Vincents	153.8	193.5	219.8	245.0	259.6	277.7	302.2	326.5
3	Sirikadura Estate	157.2	194.1	218.6	242.0	255.5	272.4	295.2	317.8
4	Pelawatte	155.9	205.5	238.3	269.8	287.9	310.6	341.1	371.5
5	Balapitiya	129.6	171.0	198.5	224.8	239.9	258.8	284.3	309.7
6	Horagoda	107.9	148.8	175.9	201.9	216.9	235.6	260.8	285.9
7	Geekiyanakanda	157.7	201.8	231.1	259.1	275.2	295.3	322.5	349.6
8	Charley Mt.Estate	116.0	161.3	191.3	220.1	236.7	257.4	285.3	313.1
9	Thihagoda	108.3	142.4	165.0	186.7	199.2	214.8	235.9	256.8
10	Hiyare	133.8	177.8	207.0	234.9	251.0	271.1	298.2	325.2
11	Beausersejour	129.6	160.8	181.4	201.2	212.6	226.9	246.1	265.2
12	Arpthorpe Estate	132.9	151.5	163.9	175.7	182.5	191.0	202.5	213.9
13	Goluwawatte	125.3	165.2	191.7	217.1	231.7	250.0	274.6	299.1
15	Dandeniya Tank	103.5	147.0	175.8	203.5	219.4	239.2	266.0	292.7
16	Ellawela Tank	103.9	136.8	158.6	179.5	191.5	206.6	226.8	247.0
18	Kirama	100.0	136.5	160.6	183.8	197.1	213.7	236.2	258.6
20	Tangalla	89.6	139.5	172.6	204.3	222.6	245.4	276.2	306.9
22	Udukiriwela	79.5	94.6	104.7	114.3	119.8	126.7	136.0	145.3

Maximum 3days Rainfall

(Unit : mm)

No.	Station	Return Period (Years)							
		2	5	10	20	30	50	100	200
1	Kalutara	216.2	288.2	335.8	381.5	407.8	440.7	485.0	529.2
2	St.Vincents	261.5	326.1	368.8	49.8	433.4	462.9	502.7	542.3
3	Sirikadura Estate	252.7	320.2	364.9	407.7	432.4	463.2	504.8	546.2
4	Pelawatte	264.9	326.2	366.8	405.8	428.2	456.2	494.0	531.6
5	Balapitiya	210.2	277.0	321.3	363.8	388.2	418.7	459.9	501.0
6	Horagoda	206.3	268.6	309.9	349.5	372.3	400.7	439.1	477.4
7	Geekiyanakanda	264.7	330.9	374.8	416.8	441.0	471.2	512.0	552.6
8	Charley Mt.Estate	173.3	244.5	291.6	336.9	362.9	395.4	439.3	483.0
9	Thihagoda	162.6	205.0	233.1	260.1	275.6	295.0	321.1	347.2
10	Hiyare	208.5	272.2	314.4	354.9	378.2	407.3	446.6	485.7
11	Beausersejour	203.4	247.4	276.5	304.4	320.4	340.5	367.6	394.5
12	Arpthorpe Estate	213.1	254.6	282.1	308.5	323.6	342.6	368.2	393.6
13	Goluwawatte	209.0	264.6	301.4	336.7	357.0	382.4	416.6	450.8
15	Dandeniya Tank	160.9	230.4	276.4	320.5	345.9	377.6	420.4	463.0
16	Ellawela Tank	153.4	202.2	234.5	265.5	283.3	305.6	335.6	365.5
18	Kirama	154.1	205.3	239.1	271.6	290.3	313.6	345.1	376.5
20	Tangalla	125.8	193.3	238.0	280.9	305.5	336.3	377.9	419.4
22	Udukiriwela	112.2	133.3	147.2	160.6	168.3	177.9	190.8	203.8

Maximum 5days Rainfall

(Unit : mm)

No.	Station	Return Period (Years)							
		2	5	10	20	30	50	100	200
1	Kalutara	265.8	357.6	418.4	476.7	510.2	552.1	608.7	665.0
2	St.Vincents	311.2	387.7	438.4	487.0	515.0	550.0	597.1	644.1
3	Sirikadura Estate	322.8	406.3	461.6	514.7	545.2	583.3	634.8	686.1
4	Pelawatte	351.2	418.9	463.8	506.8	531.6	562.5	604.2	645.8
5	Balapitiya	269.5	350.4	403.9	455.2	484.8	521.7	571.5	621.1
6	Horagoda	277.9	357.0	409.4	459.6	488.5	524.7	573.4	622.0
7	Geekiyanakanda	327.3	407.8	461.1	512.2	541.6	578.4	628.0	677.4
8	Charley Mt.Estate	209.7	290.9	344.7	396.2	425.9	462.9	512.9	562.8
9	Thihagoda	195.9	253.0	290.7	327.0	347.8	373.9	409.0	444.0
10	Hiyare	259.9	344.9	401.2	455.1	486.2	525.0	577.4	629.6
11	Beausersejour	251.8	309.4	347.6	384.2	405.2	431.5	467.0	502.4
12	Arpthorpe Estate	259.9	310.7	344.4	376.7	395.3	418.5	449.8	481.0
13	Goluwawatte	259.3	322.5	364.3	404.4	427.5	456.3	495.2	534.0
15	Dandeniya Tank	194.3	272.2	323.8	373.2	401.7	437.3	485.3	533.1
16	Ellawela Tank	186.3	237.4	271.3	303.7	322.4	345.7	377.2	408.6
18	Kirama	193.1	258.6	302.0	343.6	367.5	397.5	437.8	487.0
20	Tangalla	145.1	214.6	260.6	304.7	330.1	361.8	404.6	447.3
22	Udukiriwela	144.1	184.1	210.6	236.0	250.6	268.9	293.5	318.1

Table 5.1-10 (1/2) Probable Areal Rainfall of Each River Basin

(Unit : mm)

No.	River Basin	Catch. Area (km2)	Annual Mean	Annual Maximum Probable Rain 5	10	20	50	Annual Minimum Probable Rain 5	10	20	50
1	Benthara Ganga	622.0	4,030.4	4,468.4	4,824.5	5,166.1	5,608.3	3,507.2	3,265.7	3,074.0	2,866.2
2	Welipenne Ganga	229.9	3,772.3	4,204.5	4,556.0	4,893.1	5,329.5	3,256.1	3,025.8	2,844.9	2,650.9
3	Polwatte Ganga	233.0	2,809.4	3,179.1	3,479.9	3,768.3	4,141.7	2,369.2	2,154.9	1,981.9	1,791.4
4	Kirama Oya	222.9	1,776.2	2,089.8	2,344.8	2,589.5	2,906.1	1,418.8	1,264.1	1,143.6	1,015.7
5	Urubokka Oya	348.0	1,726.4	1,966.2	2,161.2	2,348.3	2,590.5	1,432.5	1,299.0	1,193.7	1,080.3
6	Kachigara Ara	220.0	1,186.0	1,368.0	1,534.8	1,684.8	1,879.1	954.1	847.6	763.3	672.2
7	Walawe Ganga	2,442.0	1,859.8	2,144.2	2,375.5	2,597.3	2,884.5	1,517.6	1,362.1	1,239.2	1,106.3
8	Malala Oya	399.0	1,123.1	1,329.6	1,497.5	1,658.6	1,867.1	870.7	760.8	675.1	584.0

Table 5.1-10 (2/2) Probable Areal Rainfall of Each River Basin

(Unit : mm)

No	River Basin	Catch. Area (km2)	Daily Max Rainfall 5	10	20	50	3-Days Max Rainfall 5	10	20	50	5-Days Max Rainfall 5	10	20	50
1	Benthara Ganga	622.0	192.7	220.5	247.2	281.8	313.6	354.9	394.5	445.7	394.9	443.2	489.6	549.6
2	Welipenne Ganga	229.9	195.7	222.1	247.3	280.0	323.5	367.0	408.7	462.8	401.8	454.3	504.6	569.8
3	Polwatte Ganga	233.0	165.7	192.1	217.4	250.3	255.4	294.2	331.5	379.7	314.6	362.2	407.8	466.9
4	Kirama Oya	222.9	131.2	155.3	178.4	208.2	191.2	225.2	257.9	300.1	230.6	270.4	308.5	357.9

Table 5.1-13 Daily Mean Discharge Data of Polwatte Ganga at Yakkalamulla

(m³/sec)

	1990									1991		
Date	Feb.	Mar	May	Jun	Jul	Aug	Oct	Nov	Dec	Jan	Feb	Mar
1	-	0.16	2.36	2.80	1.83	1.78	0.12	△	2.80	1.83	1.88	1.88
2	-	0.08	2.85	2.36	2.20	1.78	0.12	△	2.65	1.25	1.72	2.31
3	-	0.04	2.75	1.94	1.99	2.10	0.12	△	2.20	1.08	1.29	2.10
4	-	0.03	2.94	2.31	2.80	1.83	0.05	△	1.88	0.96	1.16	1.88
5	-	0.03	3.13	2.26	2.26	0.78	0.04	△	1.72	3.14	1.04	1.67
6	-	0.03	2.75	2.04	1.99	0.92	0.04	△	2.10	2.20	0.96	1.34
7	-	0.05	2.90	2.31	2.94	1.29	0.03	△	1.88	1.78	1.04	1.12
8	-	0.53	2.31	2.80	3.18	1.04	0.03	△	2.25	1.20	0.96	1.00
9	-	1.94	1.94	2.26	2.70	1.25	0.03	△	2.75	0.96	1.78	0.80
10	-	1.72	2.31	1.89	2.26	0.92	0.03	△	1.62	1.83	1.00	0.56
11	-	1.16	2.80	2.61	2.40	1.12	0.04	△	1.78	1.56	0.88	0.46
12	-	1.00	2.99	△	2.65	1.72	0.07	△	1.99	1.88	0.85	0.34
13	-	1.88	2.99	3.28	1.67	1.25	0.14	3.19	1.62	1.39	1.00	0.31
14	-	3.28	3.28	2.75	2.15	0.92	0.20	3.19	2.85	1.00	0.85	0.23
15	1.34	2.45	3.33	1.56	2.75	1.00	0.43	2.36	2.15	0.92	0.77	0.18
16	1.00	2.15	△	1.08	3.23	-	0.53	3.14	2.94	0.96	0.63	0.14
17	1.43	1.88	△	1.83	3.23	-	1.16	2.65	1.75	△	0.53	1.29
18	0.23	1.28	△	2.31	2.10	-	2.10	2.25	1.88	△	0.50	0.88
19	0.14	1.88	△	2.10	1.83	-	1.88	1.94	1.20	△	0.43	0.56
20	0.10	1.04	△	1.88	2.04	-	2.25	1.88	2.15	△	0.34	0.46
21	0.06	0.84	3.28	2.31	1.20	-	2.70	1.72	1.83	△	0.28	0.40
22	0.05	0.80	3.13	1.88	1.78	-	2.31	2.25	1.16	△	0.46	0.30
23	0.05	0.96	2.80	2.26	2.15	-	2.75	1.82	2.25	3.09	0.37	0.28
24	0.04	0.77	2.80	2.85	1.83	-	2.36	1.99	2.94	2.65	0.31	0.25
25	0.05	0.84	2.99	2.70	2.36	-	△	1.67	△	2.20	0.31	0.20
26	0.04	1.00	2.70	2.36	1.99	-	△	2.31	3.13	1.67	0.37	0.18
27	0.06	1.12	2.26	2.04	1.67	-	△	1.88	2.65	1.29	1.83	0.28
28	0.05	△	2.04	1.78	1.08	-	△	1.78	1.83	1.12	1.12	0.20
29	×	2.45	1.78	2.20	1.04	-	△	△	1.94	0.96	×	0.30
30	×	1.47	2.94	1.99	1.67	-	△	△	1.62	1.00	×	0.92
31	×	1.94	1.78	×	1.67	-	-	×	1.56	1.80	×	0.88
Mean	0.33	1.16	2.70	2.23	2.15	1.31	0.81	2.25	2.10	1.59	0.88	0.76

Source: Observed Data by ID, 1990

Note : on the △ mark day, water level is too high and impossible to calculate discharge data

- mark means data error.

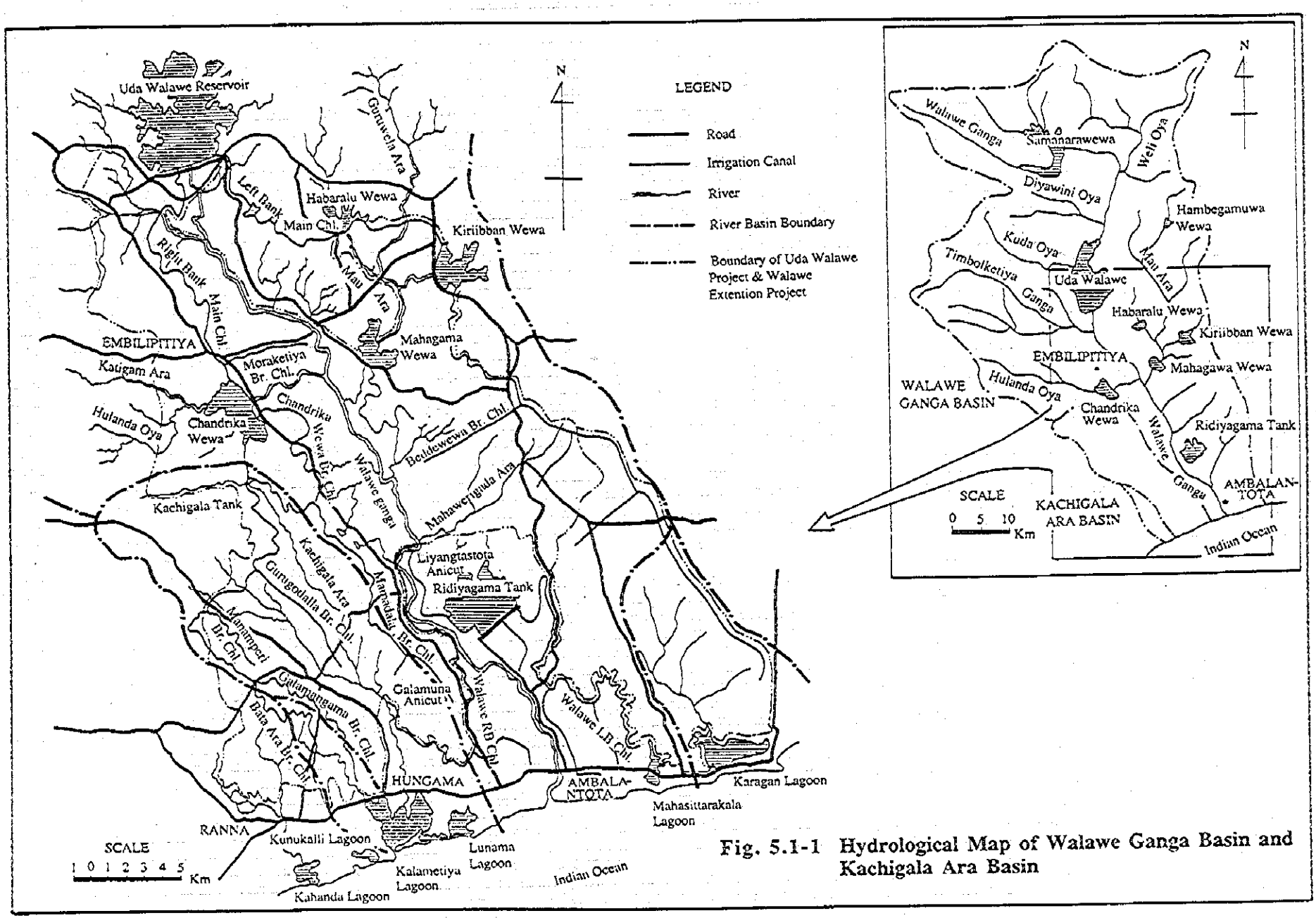


Fig. 5.1-1 Hydrological Map of Walawe Ganga Basin and Kachigala Ara Basin

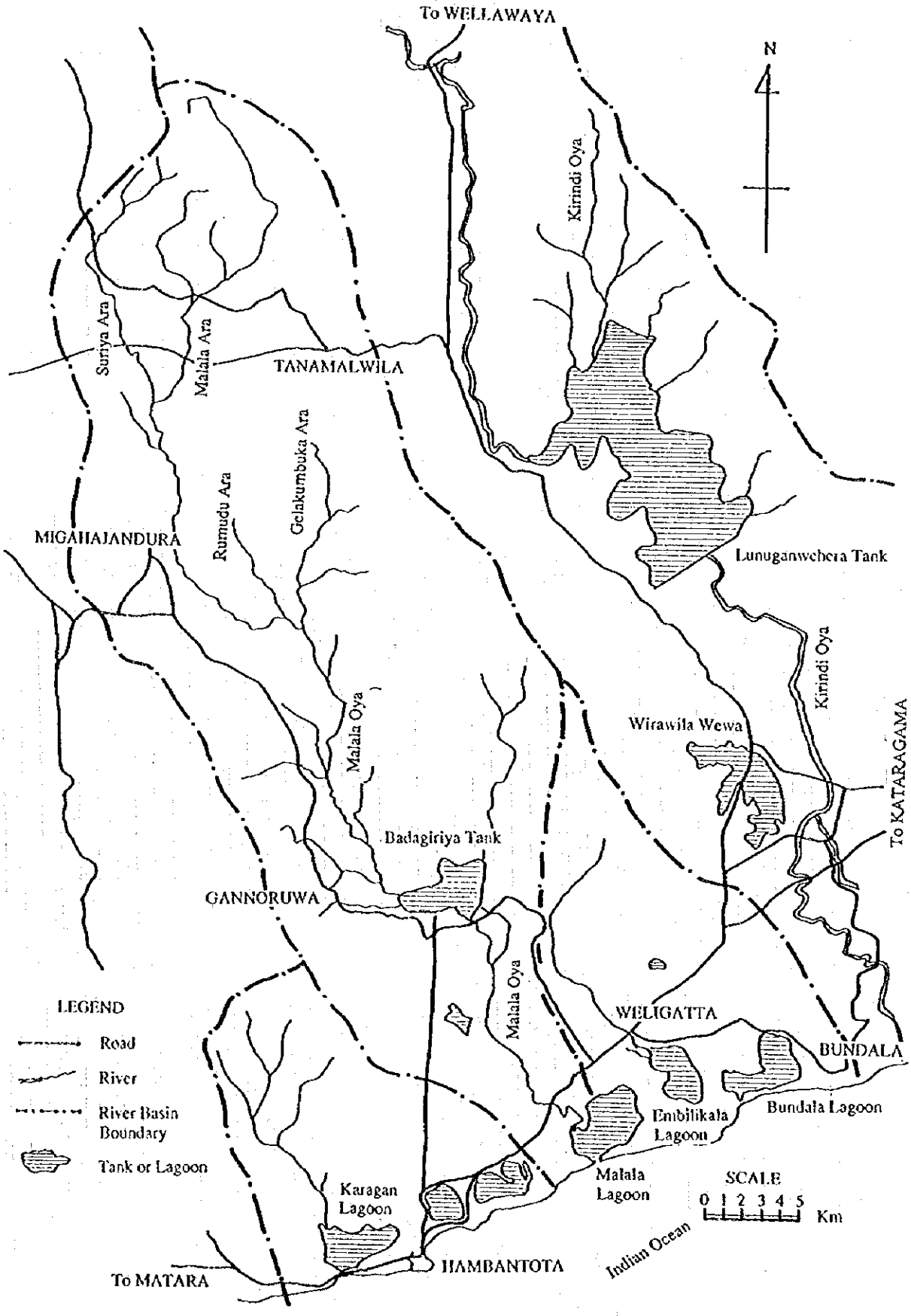


Fig. 5.1-2 Hydrological Map of Malala Oya Basin

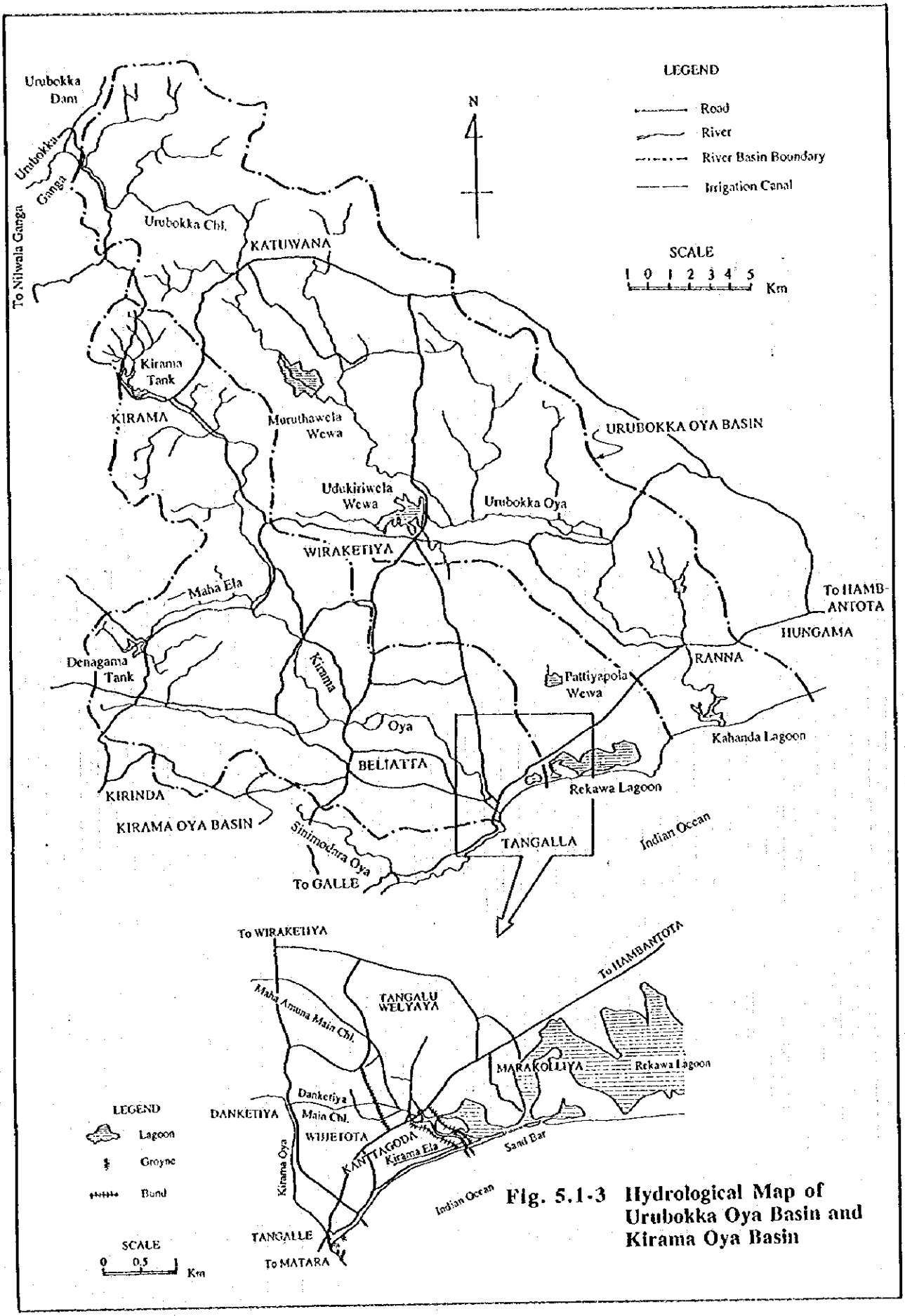


Fig. 5.1-3 Hydrological Map of Urubokka Oya Basin and Kirama Oya Basin

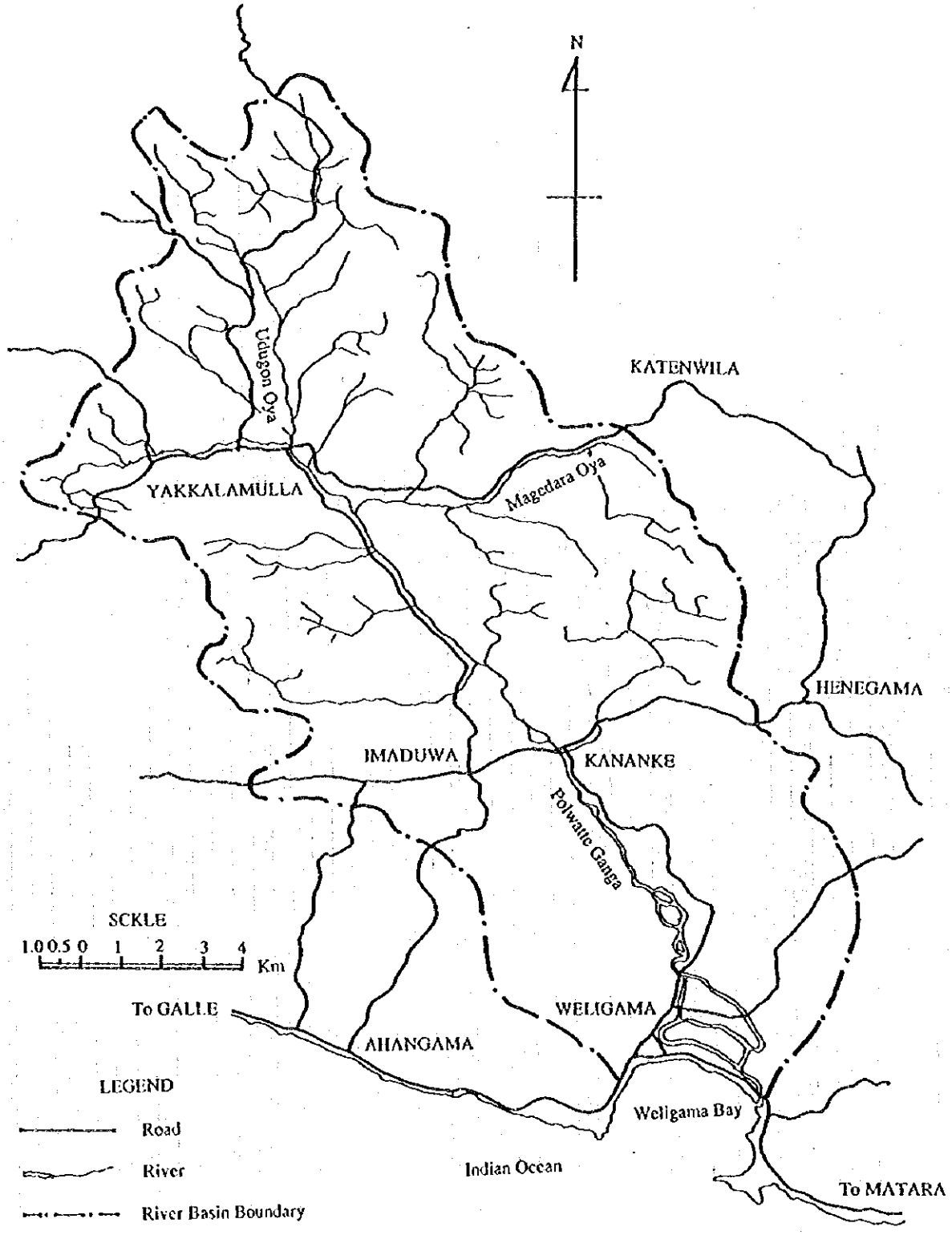


Fig. 5.1-4 Hydrological Map of Polwatte Ganga Basin

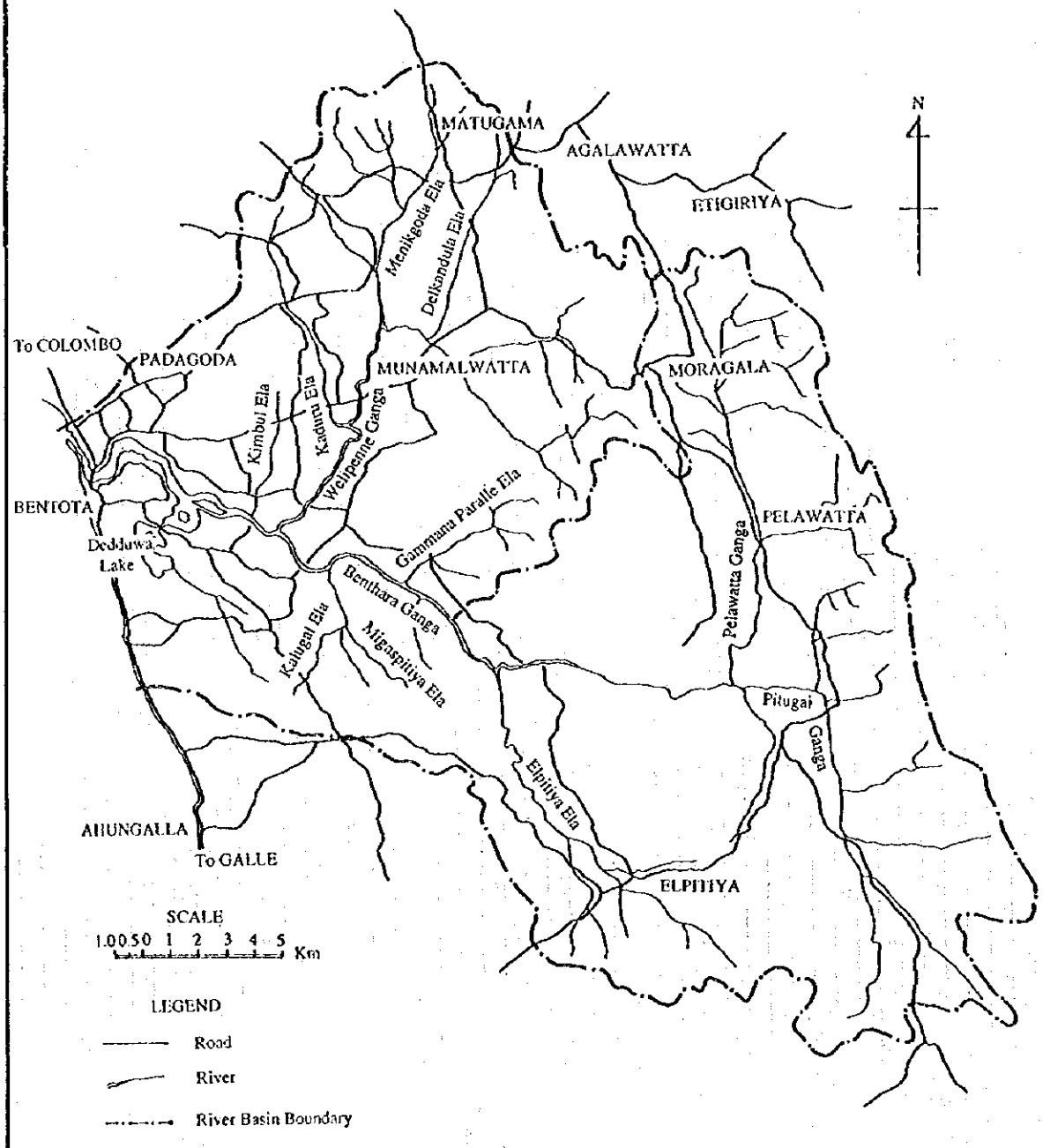


Fig. 5.1-5 Hydrological Map of Welipenne Ganga Basin

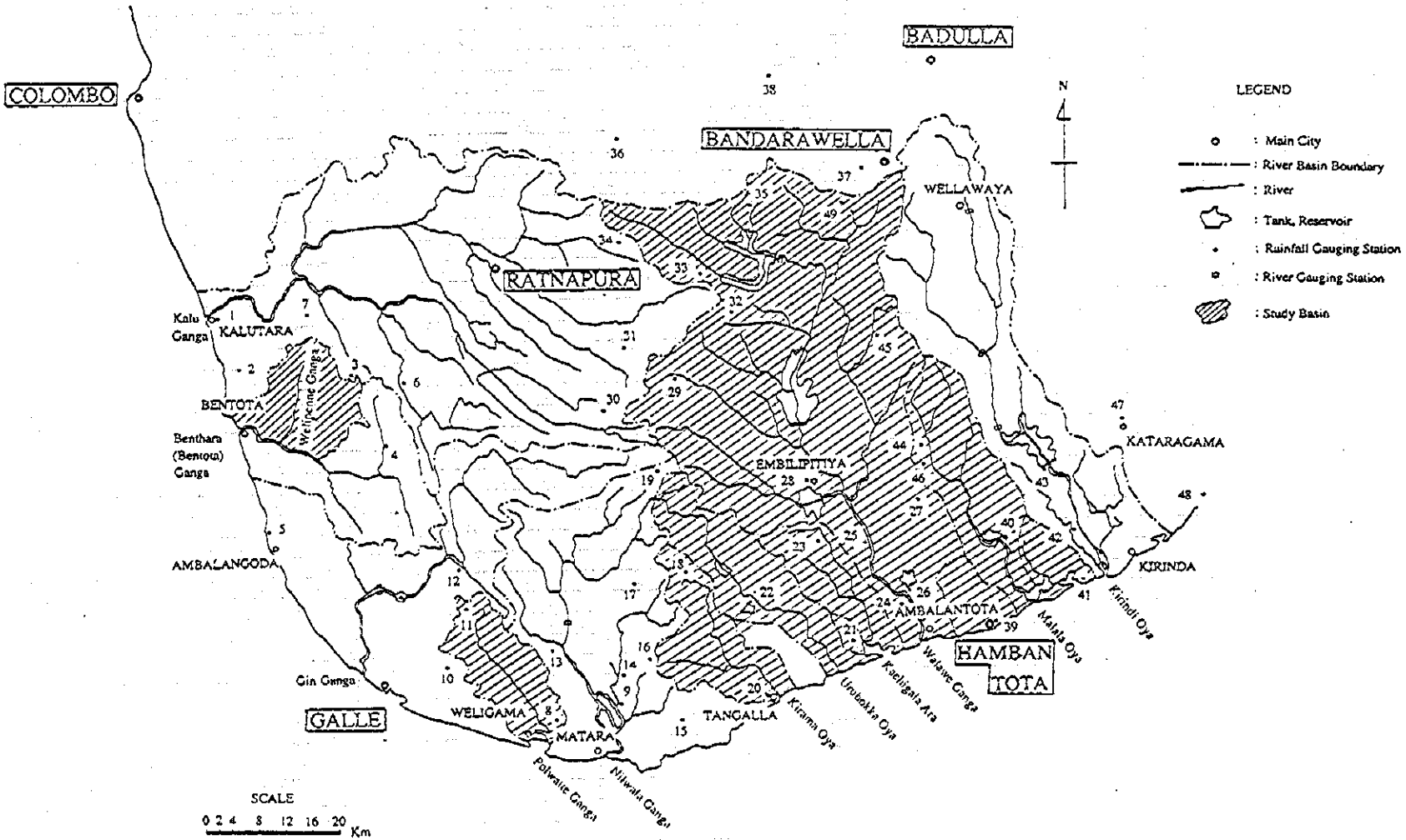


Fig. 5.1-6 Location Map of Meteorological Station, Rainfall Gauging Station and River Gauging Station

5.2 Liyangastota Scheme

5.2.1 Irrigation and Drainage System

(1) Location and Basin Description

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 m3) and Samanalawewa Reservoir (completed in 1993; storage = 218 million m3) 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.

Liyangastota Scheme comprises of 2 schemes called Walawe Ganga Left Bank (WLB) and Walawe Ganga Right Bank (WRB) scheme. The main source of irrigation water is from Walawe Ganga diverted at Liyangastota Anicut.

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 anicut to the right bank is called the Walawe Right Bank Scheme. Areas near the river mouth (Nonagama on the right bank and Wanduruppa on the left bank) are inundated during flooding, with resultant crop damage, due to blocked by sand bars at the river mouth.

(2) Present Conditions of Irrigation System

a) Command Area

The Liyangastota anicut was constructed in 1889 and the WLB and WRB schemes were completed in 1928 and 1927, respectively. Since then no rehabilitation has been done.

The Feeder Canal on the left bank of Liyangastota anicut diverts water into Ridiyagama Reservoir which is providing irrigation water to a total command area 3,282 ha of WLB scheme; a total command area 2,768 ha of WRB scheme is fed directly from Liyangastota anicut through RB main canal.

Command areas identified by the Study Team according to Water Issue Tree prepared by Department of Irrigation are as follows:

Name of Scheme	Command Areas (ha)	
WRB Scheme	3,282	
WLB Scheme	2,767	Ridiyagama Unit: 840
		Bolama Unit: 1,927
Total	6,049	

b) Schematic Diagram

The schematic diagram of WLB and WRB is shown in Fig.5.2.1-1.

c) Parameters of Irrigation System

Parameters of irrigation system are shown in Table 5.2.1-1.

d) Years of Completion of Main Structures in the Schemes

Year of completion of the Main Structures in the Schemes are as follows:

Name of Stuructures	Year of Completion
Liyangastota Anicut	1889
Feeder Canal	1889
Ridiyagama Reservoir	1927 (1925 - 1927)
WLB Canal Systems	1928 (1926 - 1928)
WRB Canal Systems	1927

e) Allocation of Irrigation Water at Liyangastota Anicut

Following parameters were identified from data prepared by ID.

Scheme	Main Sluice Gate					Liyangastota Anicut	
	Discharge cusec(cumecs)	F.S.L	Sill Level	Openings No.s	Size (WxH)	Crest Level of Plank	H.F.L
WRB (RB Main Canal)	290 (8.12)	20.57	17.689	4	1,976x1,064 (A=2.10m²)	20.937	24.57
WLB (Feeder Canal)	277 (7.77)	20.57	18.647	2	1.520x2.128 (A=3.23m²)	20.937	24.57

Source : Irrigation Dept. (I.E. Office Ambalantota)

However, it was observed that diversion of water at the Anicut did not attain the design discharge level due to the following reasons:

- Sedimentation on the upstream of both LB and RB main sluices,
- Absence of proper measuring structures at both intakes, and
- Changes in Walawe river flow after the construction of Udawalawe Reservoir

which is located upstream of Liyangastota anicut.

(3) Present Condition of Irrigation Facilities

a) Liyangastota Anicut

i. Features of Facilities

The anicut was constructed in 1889 with rubble masonry and the main features are as follows:

Facility	Basic Features		Design Value
Anicut	Catchment Area		2,260 km^2
	Annual Rainfall (average)		1,340 mm
	Annual Runoff (average)		2,200 MCM
	H.F.L		24,570 m MSL
	F.S.L		20,570 m
	Crest Level of Planked Bays		20.937 m
	Sill Level of Control Bays		18.194 m
	Sill Level of Bays		17.432 m
	Length of Anicut		73.00 m
	No. of Bays		16 (W=1.753 x H=3.505m)
	No. of Ejectors		4 (W=1.219 x H=1.524 - 2.744 m)
	Opening of Control Bays		1.83 m x 3.35 m
Intake Gate	Right Bank (R/B)	F.S.L	20.570 m MSL
		Sill Level	17.689 m
		Intake Facility	4 No.s (W=1.976 x H=1.604 m)
		Design Discharge	290 cusec (8.12 m^3/s)
	Left Bank (L/B)	F.S.L	20.570m MSL
		Sill Level	18.647 m
		Intake Facility	2 No.s (W=1.520 x H=2.128 m)
		Design Discharge	277 cusec (7.77 m^3/s)

ii. Present Condition of Anicut

- Constructed over 100 years ago using block-stone masonry with 16 Nos. timber-planked bays to head up water,
- The condition of pier seems to be adequate for the present loads but water is leaking from the side of stop logs,
- Operation of planked bays is not possible even when the river flow is low. Therefore, it is not possible to flush out the sand on the upstream side of the regulator,
- As a result, sand flows into the two main canals on LB and RB,
- There is no operation bridge across the anicut, but construction of new one might disturb the existing structure and foundation,
- To measure the discharge, Parshall Flumes down stream of each main sluice are necessary, and
- Retaining walls up stream of RB main sluice are necessary.

b) Feeder Canal and Ridiyagama Reservoir

i. Features of Facilities

Facility	Features	Design Value
Feeder Canal	Length of Canal	6.57 km
	Present Bed Width	3 to 15 m
	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
	- Water Depth	2.0m
	- Slide Slope	1 on 1
	- Gradient	0.04 (assumed)
	- Coefficient of Roughness	n=0.004 (assumed)
	- Converted discharge by Manning Formula	Q≒7.2m3/s
Ridiyagama Reservoir	<Reservoir>	
	Catchment Area	28.5 sq.km
	Capacity	26 MCM
	Dead Storage	1.968 MCM
	F.S.L	18.85 m MSL
	H.F.L	20.006 m
	Bund Top Level	20.92 m
	Free Board	0.914 m
	Bund Top Width	3.0 m
	Length	2195 m
	Side Slopes	U/S : 1 on 2
		D/S : 1 on 3
	<Intake>	
	No. of Sluices	one
	Structure	Masonry with Lifting Gates
	Opening	1.219 m (W) x 1.060 m (H) 2 Nos.
	Sill Level	13.78 m MSL
	<Spills>	
	No. of Spills	Two
	Length - Main	46.5 m, Crest Level 18.95 MSL
	- Auxiliary	92.1 m, Crest Level 19.10 MSL

ii. Present Condition of Feeder Canal

- Feeder Canal of 6.57km needs cleaning up and its embankments have to be reformed because of erosion and cattle damage from the Agricultural Department Farm,
- Water shortage occurs recently once in 4 or 5 years in the Ridiyagama Reservoir. Feeder Canal was built on the assumption that Walawe river flow remains constant; however construction of Udawalawe scheme changed this situation. Therefore farmers propose construction of an additional inlet on Walawe Ganga, just above the existing one, to get more water through a new Feeder Canal to Ridiyagama Reservoir, and

- Removal of obstructions and silt in the Feeder Canal and maintaining proper canal profiles are necessary.

iii. Present Condition of Ridiyagama Reservoir

Following repairs and improvement are considered necessary.

- Widening of dam crest from 3.0m to 6.0m for vehicular traffic,
- Earth filling on eroded dam crest and down stream slopes with a toe-filter and drains to prevent the occurrence of slope sliding,
- Placing of rip-rap on the upstream slope of the dam,
- Forming the approach canal to the main spill, and
- Provision of toe drains at the down stream of the main bund.

c) Irrigation Canals

i. Canal Length and Command Areas of WRB and WLB Scheme

The Parameters of Irrigation System are summarized below;

	Items	WRB Scheme	WLB Scheme		
			Ridiyagama Unit	Bolama Unit	Sub-total
1)	Canals (km)				
	Main	26.8	23.9 (LBM, NRB, NCB)	23.5 (SLB, SRB)	47.4
	DC (Branch)	21.1	8.4	21.5	29.9
	FC	9.0	4.0 (assumed)	14.0 (assumed)	18.0
	Total	56.9	36.3	59.0	95.3
2)	Command Area (ha)	1836.2	840.7	2,958.8	3,799.4

Details of this Irrigation System are shown in Table 5.2.1-1.

ii WRB Canals

The right bank canal impacts on the adjacent Kachigal Ara scheme to the west : drainage water converted from irrigation which supplies the Walawe R/B Scheme area causes inundation there.

Although the canal was originally designed to service 2,000 acs., it now provides irrigation water to a total of 8,284 acs. by staggering irrigation periods and performing rotational irrigation. This has required many control structures in the canal, resulting in damage to the canal, sediment, and weakening of the canal embankment, making the canal susceptible to overflow. Canal facilities including spillways, outlets, etc. accordingly require urgent repair. Cross-sectional erosion and improper functioning of intakes cause conveyance loss along the canal. Furthermore, encroachers have invaded O/M road along the canal by cultivation in order to expand farm land, hindering effective management of water distribution to service areas.

Tanks at two locations along the main canal route also require rehabilitation. The Mamdala tank midway along the canal requires a new gate, discharge measurement gauge, and slope protection works. The Oluwila tank at the extreme downstream needs rehabilitation including

repair of the Beminiyawila Basnawa drainage canal which empties into the tank. This canal requires both widening and removal of sediment in order to function as a drainage-cum-irrigation canal.

iii. WLB Canals

LB main canal branches into 2 canals, North RB and North Central Canal at a point about 150m from the main sluice. The Main and Distributory canal have got eroded and silted, outlets do not function properly and water losses are high and FC outlets are in the poorest condition in the whole Study Area. In some of the canals, land reservations for roads have been encroached by farmers.

Due to lack of proper farm roads, the farmers in the upper tract face difficulties in transporting agricultural inputs and produce. Farmers are requesting farm roads.

The main problems in WLB scheme are as follows:

- Poor condition of the main and distributory canals,
- Lack of farm roads in paddy tracts, and
- Lack of drainage in the lower tracts due to the absence of effective sea outlet.

(4) Water Balance Analysis

a) Precondition Analysis

i. Existing Field Water Requirement (FWR)

Unit water requirement for crops are estimated based on existing cropping calender and patterns. In this caluculation, main crop is set for both season as paddy 105 day variety, which is used by ID, according to the Phase I field survey (reter to Table 5.2.1-3).

ii. Inflow Data

Inflow data are set as below:

WLB scheme (A=2,767ha):	Ridiyagama Tank Water Issue Record (1986 Apr. to 1995 Jan.), refer to Fig.5.2.1-2 and Table 5.2.1-2.
WRB scheme (A=3,354ha):	Water Balance on Walawe River (refer to Table 5.2.1-2) in the F/S on Walawe Irrigation Upgrading and Extention Project Report, Volume II, 1992 JCA.

iii. Period Based on Anlysis

17 cases, from 1986 Yala to 1994 Yala, are set up for caluculation period.

b) Results of Analysis

All cases of both Yala and Maha season show their irrigation success for the whole scheme area. Therefore, cropping intensity could be proposed to raise to 200% through a year by achievement of proper rehabilitation and water management (refer to Fig. 5.2.1-3)

Table 5.2.1-1 Parameters of Irrigation System of Liyangastota Scheme

Name of D-Canals	Length of Canals		Unit Figure			Accumulated Figure		
	(Mile)	(km)	Commmand Area (Acres)	(ha)	Nos. of F-Canal	Commmand Area (Acres)	(ha)	Nos. of F-Canal
Liyangastota Scheme						**15,123**	**6,121.3**	**866**
I. Walawe RB Scheme						**8,284**	**3,353.8**	**233**
I-a RB Main	**14.3**	**23.0**	**2,945**	**1,192.3**	**44**	**3,674**	**1,488.3**	**87**
Lunama Chl	1.9	3.0	220	89.0	NA	220	89.0	NA
Dawage Chl	2.0	3.2	336	136.0	24	336	136.0	24
D-32 Chl	1.6	2.6	175	71.0	19	175	71.0	19
I-b D-1 Canal	**1.2**	**2.0**	**1,633**	**661.0**	**2**	**2,439**	**987.0**	**51**
Walawe Watta Ela Chl	0.8	1.3	474	192.0	23	474	192.0	23
Jansegama Ela Chl	0.6	1.0	287	116.0	19	331	134.0	26
Robert Watta Chl	0.1	0.2	44	18.0	7	44	18.0	7
I-c D-2 Canal	**0.9**	**1.5**	**200**	**80.9**	**8**	**200**	**80.9**	**8**
I-d D-3 Canal	**5.0**	**8.0**	**802**	**324.6**	**24**	**1,971**	**797.6**	**87**
Wickramanayaka Chl	3.7	6.0	467	189.0	54	467	189.0	54
Puhul Yaya Chl	0.3	0.5	40	16.0	NA	40	16.0	NA
Oluwila Inter Chl	0.8	1.3	198	80.0	NA	198	80.0	NA
Wata Ela Chl	0.9	1.5	464	188.0	9	464	188.0	9
Walawe RB Total	**21.4**	**34.5**	**8,284**	**3,353.8**	**233**			
II. Walawe LB Scheme						**6,839**	**2,767.5**	**633**
Ridiyagama Unit						**2,077**	**840.5**	**363**
II-a LB Main	**7.5**	**12.0**	**574**	**232.3**	**202**	**841**	**340.3**	**219**
a.1 RB 1 of Main Canal	0.6	0.9	267	108.0	17	267	108.0	17
Sub-total	8.1	13.0	841	340.3	219			
II-b NRB	5.7	9.2	436	176.4	51	459	185.7	51
b.1 FC 1 of NRB Canal	0.4	0.6	23	9.3	NA	23	9.3	NA
Sub-total	6.1	9.8	459	185.7	51			
II-c NCB Canal	1.7	2.7	297	120.2	23	777	314.4	93
c.1 LB 1 Canal	1.2	2.0	168	68.0	23	168	68.0	23
c.2 RB 1 Canal	0.5	0.8	24	9.7	6	24	9.7	6
c.3 LB 2 Canal	0.6	0.9	79	32.0	5	79	32.0	5
c.4 RB 2 Canal	1.3	2.0	128	51.8	23	128	51.8	23
c.5 LB 3 Canal	0.7	1.1	81	32.8	13	81	32.8	13
Sub-total	5.9	9.5	777	314.4	93			
Ridiyagama Unit Total	**20.1**	**32.3**	**2,077**	**840.5**	**363**			
Bolana Unit						**4,762**	**1,927.0**	**270**
II-d SLB	9.6	15.4	577	233.4	46	1,223	494.9	96
d.1 RB 1 Canal	0.2	0.3	49	20.0	2	49	20.0	2
d.2 RB 2 Canal	0.3	0.4	33	13.3	2	33	13.3	2
d.3 RB 3 Canal	0.1	0.2	69	28.1	6	69	28.1	6
d.4 RB 4 Canal	0.6	1.0	261	105.5	15	261	105.5	15
d.5 Dispensary Ela Canal	0.8	1.3	114	46.2	17	114	46.2	17
d.6 Pasala Ela Canal	0.5	0.8	119	48.3	8	119	48.3	8
Sub-total	12.1	19.4	1,223	494.9	96			
II-e SCB Canal	2.4	3.8	878	355.3	26	1,264	511.5	34
e.1 19.11 Canal	0.4	0.6	147	59.5	2	147	59.5	2
e.2 19.81 Canal	0.3	0.4	239	96.7	6	239	96.7	6
Sub-total	3.0	4.9	1,264	511.5	34			
II-f SRB	5.0	8.1	860	347.9	32	2,275	920.6	140
f.1 LB 1 Canal	1.0	1.7	152	61.4	13	152	61.4	13
f.2 LB 2 Canal	0.4	0.7	137	55.3	9	137	55.3	9
f.3 LB 3 Canal	0.6	1.0	95	38.6	11	95	38.6	11
f.4 RB 1 Canal	0.4	0.6	54	21.9	5	54	21.9	5
f.5 LB 4 Canal	1.6	2.6	242	98.0	25	282	114.2	29
LB 4A Canal	0.2	0.4	40	16.2	4	40	16.2	4
f.6 RB 2 Canal	0.4	0.7	80	32.4	3	80	32.4	3
f.7 LB 7 Canal	0.3	0.4	28	11.4	4	28	11.4	4
f.8 LB 8 Canal	1.0	1.6	258	104.5	15	359	145.5	30
LB 8A Canal	0.6	1.0	101	41.0	15	101	41.0	15
f.9 RB 3 Canal	1.3	2.1	227	91.9	4	227	91.9	4
Sub-total	12.9	20.7	2,275	920.6	140			
Bolana Unit Total	**28.0**	**45.0**	**4,762**	**1,927.0**	**270**			
Walawe LB Total	**48.0**	**77.3**	**6,839**	**2,767.5**	**633**			
Liyangastota Scheme Total	**69.5**	**111.8**	**15,123**	**6,121.3**	**866**			

Table 5.2.1-2 Water Issue Records in Present Cropping Pattern and Water Balance Calculation for Ridiyagama Tank (1986 Apr ~ 1994 Aug)

Water Year	Yala/ Maha	Water Discharge at Liyangastenna Anicut (a) (000m3)	Capacity of Ridiyagama Tank (b) (000m3)	Water Issue at Ridiyagama Tank to Walawe LB (c) (000m3)	Total (d) (000m3)	Inflow to Ridiyagama from Liyangastota (e) (000m3)	Water Issue to Walawe RB (a)-(e) (f) (000m3)	Total (g) (000m3)	Rainfall (mm)	Effective Rainfall (ER) (h) (mm)	Field Water Requirement (FWR) Paddy (mm)	OFC (mm)	Paddy Maha (Nov's - Mar's) (j) (mm)	Field Irrigation Requirement (IR) (i)-(h) (k) (mm)	Total (l) (mm)	Irrigation Duty (ID) (lit/s/1.43 (m) (mm)	Walawe LB Irrigated Area Specified Area (d)*(m) =2767 ha (n) (ha)	(%)	Walawe RB Irrigated Area Specified Area (g)*(m) =3354 ha (o) (ha)	(%)
1985 86	Yala	Apr 34,480	26,839.5	14,523.6					137.5	75.1	272	86	163	88						
	May	52,470	23,026.4	15,031.2		10,210.5	41,259.5		49.0	0.0	368	146	224	221						
	Jun	35,440	21,108.4	15,267.7		13,106.1	22,333.9		18.6	0.0	353	179	212	212						
	Jul	33,660	19,435.5	15,013.2		13,601.8	20,058.2		6.7	0.0	309	141	185	185						
	Aug	20,790	15,425.0	13,520.1	73,355.8	11,002.7	9,787.3	94,138.8	125	24	125	24	25	75	701	1,117	6,567 (237%)		8,428	(251%)
1986 87	Mah	Sep 11,930	15,641.0	0.0		13,736.1	0.0		99.2	49.4	78	6	78	29						
	Oct	51,920	16,905.8	14,936.1		1,264.8	50,655.2		165.0	93.5	275	32	275	181						
	Nov	36,760	19,373.8	13,562.8		14,404.1	22,355.9		57.0	0.0	316	98	316	316						
	Dec	63,720	23,569.4	18,473.2		17,758.4	45,961.6		43.9	0.0	284	117	284	284						
	Jan	64,990	22,026.9	15,023.9		16,930.7	48,059.3		66.6	27.6	244	88	244	216						
	Feb	21,820	20,916.3	11,956.0	70,952.0	13,913.3	7,906.7	174,538.6	1.1	0.0	102	16	102	102	1,128	1,611	4,397 (159%)		10,841	(323%)
	Yala	Mar 28,970	19,589.8	0.0		10,629.4	18,340.6		107.4	108.5	78	6	47	-62						
	Apr	52,950	18,263.2	9,490.6		-1,326.5	54,276.6		238.2	142.6	272	86	163	21						
	May	40,300	19,990.8	18,360.0		11,218.2	29,081.8		28.8	0.0	368	146	221	221						
	Jun	35,240	22,921.8	13,890.1		21,290.8	14,049.2		11.3	0.0	353	179	212	212						
	Jul	25,950	17,685.2	14,858.4		8,614.8	17,345.2		0.0	0.0	309	141	185	185						
	Aug	5,580	6,408.3	4,755.2	61,354.4	3,320.5	2,259.5	135,752.8	111.5	57.7	125	24	75	17	593	850	7,211 (261%)		15,977	(476%)
1987 88	Mah	Sep 7,330	14,437.8	0.0		13,084.7	0.0		104.1	50.1	78	6	78	0						
	Oct	41,020	17,276.0	9,298.5		2,838.2	38,181.8		265.2	160.7	275	32	275	114						
	Nov	65,850	23,569.4	9,947.6		15,591.9	50,268.1		200.0	117.0	316	98	316	199						
	Dec	47,970	22,964.7	15,010.8		9,343.9	38,627.1		54.5	0.0	284	117	284	284						
	Jan	40,950	22,829.0	15,298.2		14,875.1	26,074.9		52.7	0.0	244	88	244	244						
	Feb	46,920	22,088.6	6,074.3	55,629.4	14,557.8	32,362.2	185,514.8	78.2	35.4	102	16	102	67	908	1,298	4,284 (155%)		14,288	(426%)
	Yala	Mar 45,370	26,839.5	6,409.7		10,825.2	34,544.8		149.5	83.1	78	6	47	-36						
	Apr	98,330	26,839.5	12,309.2		6,409.3	91,920.3		177.7	102.0	272	86	163	61						
	May	90,890	25,297.0	14,820.9		10,766.7	80,123.3		92.5	38.3	368	146	221	183						
	Jun	35,340	23,569.4	14,054.1		13,093.3	22,246.7		63.6	25.6	353	179	212	186						
	Jul	35,960	22,335.4	14,408.0		12,820.1	23,139.9		50.2	0.0	309	141	185	185						
	Aug	22,390	20,978.0	1,565.0	63,586.9	13,050.6	9,339.4	261,714.5	39.7	0.0	125	24	75	75	654	935	6,880 (246%)		27,986	(834%)
1988 89	Mah	Sep 12,230	25,297.0	7,256.4		5,904.0	6,326.0		79.9	36.5	78	6	78	41						
	Oct	41,920	22,964.7	14,137.3		4,924.1	36,995.9		187.3	108.5	275	32	275	167						
	Nov	73,360	20,978.0	8,676.1		12,150.6	61,209.4		314.8	193.9	316	98	316	122						
	Dec	26,160	19,863.4	15,281.6		7,565.5	18,594.5		123.1	65.5	284	117	284	219						
	Jan	35,850	20,484.4	11,999.4		15,898.6	19,951.4		92.7	45.1	244	88	244	199						
	Feb	21,820	18,510.0	0.0	57,360.7	10,025.0	11,795.0	154,872.2	17.2	0.0	102	16	102	102	650	1,215	4,321 (171%)		13,748	(380%)
	Yala	Mar 26,070	18,818.5	12,105.6		306.5	25,763.5		67.3	28.1	78	6	47	19						
	Apr	52,950	16,782.4	10,399.5		10,009.5	42,880.5		104.9	53.3	272	86	163	110						
	May	63,600	17,492.0	12,812.0		11,109.1	52,490.9		19.5	0.0	368	146	221	221						
	Jun	37,240	19,898.3	13,738.6		15,218.3	22,021.7		43.7	0.0	353	179	212	212						
	Jul	38,660	21,348.2	9,763.4		15,588.5	23,071.5		85.0	39.9	309	141	185	145						
	Aug	15,120	22,212.0	0.0	56,849.0	8,657.2	6,462.8	173,089.0	42.0	0.0	125	24	75	75	782	1,118	5,085 (184%)		15,484	(462%)
1989 90	Mah	Sep 6,530	24,556.6	8,681.7		2,344.6	4,185.4		64.5	26.2	78	6	78	52						
	Oct	41,020	21,224.8	12,668.4		5,349.9	35,670.1		41.9	0.0	275	32	275	275						
	Nov	55,560	12,216.6	11,200.6		3,660.2	51,899.8		92.2	44.8	316	98	316	271						
	Dec	40,970	15,548.4	13,229.7		14,532.4	26,437.6		10.7	0.0	284	117	284	284						
	Jan	43,050	15,641.0	10,937.4		13,322.2	29,727.8		51.6	0.0	244	88	244	244						
	Feb	40,420	13,831.3	0.0	56,737.7	13,127.8	27,292.2	175,213.0	0.0	0.0	102	16	102	102	1,228	1,756	3,230 (117%)		9,977	(297%)
	Yala	Mar 39,870	26,839.5	17,225.7		9,908.2	30,661.8		74.7	33.0	78	6	47	14						
	Apr	53,550	21,595.0	12,788.7		11,981.2	41,568.8		56.4	0.0	272	86	163	163						
	May	58,200	25,050.2	13,812.0		16,243.9	41,956.1		124.0	66.1	368	146	221	155						
	Jun	41,440	21,595.0	15,653.0		10,356.8	31,083.2		48.2	0.0	353	179	212	212						
	Jul	32,760	19,435.5	5,682.6		13,493.5	19,266.5		41.6	0.0	309	141	185	185						
	Aug	21,090	22,119.5	0.0	65,162.0	8,366.6	12,723.4	177,259.8	0.0	0.0	125	24	75	75	864	1,150	5,568 (201%)		15,419	(460%)
1990 91	Mah	Sep 4,430	26,160.8	13,993.0		4,041.3	388.7		17.3	0.0	78	6	78	78						
	Oct	42,120	20,423.3	5,180.1		12,112.2	43,966.5		237.5	142.1	275	32	275	133						
	Nov	69,260	17,399.4	6,189.3		11,742.3	57,517.8		256.3	154.7	316	98	316	161						
	Dec	40,970	22,952.4	10,651.6		4,005.0	29,227.7		155.2	87.0	284	117	284	197						
	Jan	43,000	16,905.8	5,530.2		10,876.4	38,955.0		203.4	119.3	244	88	244	125						
	Feb	40,000	22,212.0	514.9	41,353.2		29,123.6	198,849.2	3.3	0.0	102	16	102	102	706	1,138	3,633 (131%)		13,470	(521%)
	Yala	Mar 39,000	25,914.0	16,518.3		8,216.9	34,783.1		47.3	0.0	78	6	47	47						
	Apr	52,000	20,734.2	11,231.4		11,335.5	40,664.5		129.0	69.4	272	86	163	94						
	May	40,000	24,558.8	15,233.8		15,056.5	24,943.5		103.9	52.6	368	146	221	168						
	Jun	35,000	25,667.2	11,919.6		16,344.4	18,655.6		250.0	150.5	353	179	212	61						
	Jul	25,000	26,160.8	7,016.7		12,413.2	12,586.8		91.3	44.2	309	141	185	141						
	Aug	5,000	25,790.8	0.0	61,919.5	6,686.5	0.0	131,633.4	30.0	0.0	125	24	75	75	586	838	7,385 (267%)		15,699	(468%)
1991 92	Mah	Sep 7,000	26,839.5	14,356.3		1,048.9	5,951.1		29.2	0.0	78	6	78	78						
	Oct	41,000	14,561.2	8,755.7		2,078.0	38,922.0		265.2	160.7	275	32	275	114						
	Nov	65,000	21,595.0	13,435.9		15,789.5	49,210.5		195.0	113.6	316	98	316	202						
	Dec	47,000	25,297.0	13,996.1		17,141.9	29,858.1		150.2	83.6	284	117	284	200						
	Jan	40,000	26,807.6	10,003.1		17,106.7	22,893.3		25.4	0.0	244	88	244	244						
	Feb	46,000	22,582.2	0.0	61,551.0	6,177.2	39,822.3	186,657.4	0.0	0.0	102	16	102	102	941	1,346	4,648 (168%)		13,870	(414%)
	Yala	Mar 45,000	26,839.5	13,176.3		4,257.3	40,742.7		0.0	0.0	78	6	47	47						
	Apr	52,000	14,437.8	7,209.1		774.6	51,225.4		155.5	0.0	272	86	163	163						
	May	40,000	3,794.6	6,120.9		-3,434.1	43,434.1		144.5	79.8	368	146	221	141						
	Jun	35,000	4,936.0	5,768.3		7,262.4	27,737.6		19.6	0.0	353	179	212	212						
	Jul	25,000	2,128.7	2,253.8		2,961.0	22,039.0		64.8	26.4	309	141	185	159						
	Aug	5,000	3,591.4	528.9	35,557.4	3,216.6	1,783.4	184,962.3	37.8	0.0	125	24	75	75	797	1,139	3,121 (113%)		16,408	(489%)
1992 93	Mah	Sep 7,000	3,591.4	591.8		528.9	6,471.1		113.0	58.7	78	6	78	19						
	Oct	41,000	11,106.0	7,908.2		9,106.4	31,893.6		87.7	41.7	275	32	275	233						
	Nov	73,000	10,423.3	7,956.3		7,230.0	65,770.0		271.3	164.8	316	98	316	151						
	Dec	26,000	20,299.3	9,697.0		17,828.3	8,171.7		94.7	46.4	284	117	284	238						
	Jan	35,000	25,839.5	14,357.6		16,227.2	18,772.8		21.7	0.0	244	88	244	244						
	Feb	21,000	25,790.8	12,775.2	53,276.5	13,308.7	7,691.3	138,794.5	17.7	0.0	102	16	102	102	987	1,412	3,373 (136%)		9,828	(293%)
	Yala	Mar 26,000	25,420.4	0.0		12,405.0	13,595.0		27.6	0.0	78	6	47	47						
	Apr	52,000	26,839.5	16,718.6		1,419.1	50,580.9		106.3	54.2	272	86	163	109						
	May	40,000	22,088.6	9,838.2		11,967.7	28,032.3		169.4	96.5	368	146	221	124						
	Jun	35,000	26,839.5	12,083.3		14,589.1	20,410.9		117.3	61.6	353	179	212	150						
	Jul	25,000	26,839.5	15,032.8		12,083.2	12,916.7		44.7	0.0	309	141	185	185						
	Aug	5,000	22,475.0	6,829.7	60,512.7	10,368.3	0.0	125,535.8	0.2	0.0	125	24	75	75	691	998	6,125 (221%)		12,709	(379%)
1993 94	Mah	Sep 7,000	26,839.5	6,861.7		11,494.3	0.0		11.8	0.0	78	6	78	78						
	Oct	41,000	25,050.2	11,692.6		5,072.4	35,927.6		154.3	85.4	275	32	275	189						
	Nov	73,000	26,839.5	7,532.9		13,481.9	59,518.1		337.3	209.0	316	98	316	107						
	Dec	26,000	26,839.5	7,914.3		7,532.9	18,467.1		236.8	141.6	284	117	284	142						
	Jan	21,000	24,433.2	7,892.0		5,508.0	15,492.0		59.0	0.0	244	88	244	244						
	Feb	26,000	18,510.0	0.0	43,833.5	1,968.8	24,031.2	153,436.0	11.8	0.0	102	16	102	102	862	1,233	3,399 (123%)		12,447	(371%)
	Yala	Mar 52,000	26,807.6	15,159.4		7,897.6	44,102.4		129.7	69.5	78	6	47	-23						
	Apr	40,000	22,458.8	11,493.1		11,210.6	28,789.4		101.7	51.1	272	86	163	112						
	May	35,000	17,831.3	14,311.8		6,865.6	28,134.4		37.8	0.0	368	146	221	221						
	Jun	25,000	17,322.8	14,905.8		14,003.3	10,996.7		10.3	0.0	353	179	212	212						
	Jul	5,000	13,080.4	11,359.6		10,463.4	0.0		60.3	0.0	309	141	185	185						
	Aug	7,000	15,548.4	650.4	67,680.1	13,627.6	0.0	112,022.9	45.3	0.0	125	24	75	75	782	1,118	6,052 (219%)		10,018	(299%)

Table 5.2.1-3 Existing Field Water Requirement for Paddy (105 days Variety)

KC:	Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Grouwth Stage	STEP 1	0.90			1.00	1.15	1.20	0.90			1.00	1.15	1.20	0.90
and Crop factors	STEP 2	2.0	0.90		1.00	1.15	1.20	0.90			1.00	1.15	1.20	
	STEP 3	1.20	0.90		1.00	1.15	1.20	0.90			1.00	1.15	1.20	
	STEP 4	1.5	1.20	0.90		1.00	1.15	1.20	0.90			1.00	1.15	

Eto (Evapotranspiration of Reterence Crop in inches)		4.7	5.0	6.2	5.9	6.4	6.9	7.5	7.6	7.5	6.2	4.3	4.5
1. Etc	ETc (S_1)	0.53			0.98	1.23	1.38	0.84			1.03	0.82	0.90
Crop water Requirement					0.57	0.64	0.52				0.59	0.43	0.34
	ETc (S_2)	0.24			0.74	0.27	0.33	0.38			0.78	0.18	0.22
		0.88				1.53	1.73	1.41				1.03	1.13
ETC=Eto.KC (in inches)	ETc (S_3)	0.94	0.56			1.07	1.32	1.50				0.72	0.86
		0.35				0.61	0.69	0.56	0.86			0.41	0.45
	ETc (S_4)	1.18	0.25			0.80	0.29	0.36	0.38			0.54	0.19
		0.35	0.94				1.65	1.88	1.43				1.08
	Total ETc	4.35	1.75		2.29	6.15	7.91	6.93	2.67		2.40	4.13	5.17
2. LP (Land Preparation)				2.33	4.66	2.33				2.33	4.66	2.33	
3. Farm Losses		5.25	2.25	0.75	3.75	6.00	6.00	5.25	2.25	0.75	3.75	6.00	6.00
4=1+2+3 FWR (Field Water Requirement)		9.60	4.00	3.08	10.70	14.48	13.91	12.18	4.92	3.08	10.81	12.46	11.17
do (in mm)		244	102	78	272	368	353	309	125	78	275	316	284

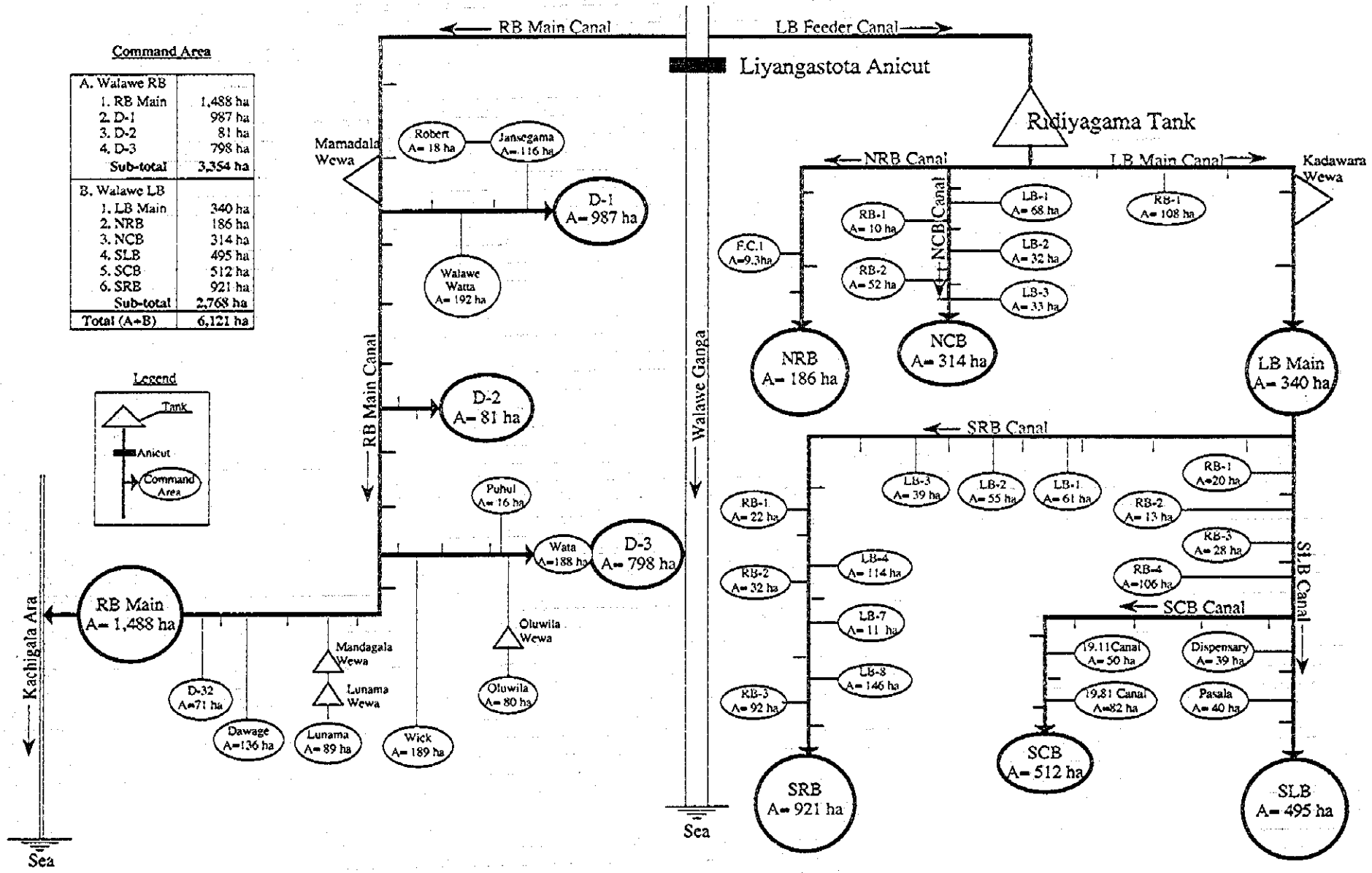


Fig. 5.2.1-1 Schematic Diagram of Liyangastota Scheme

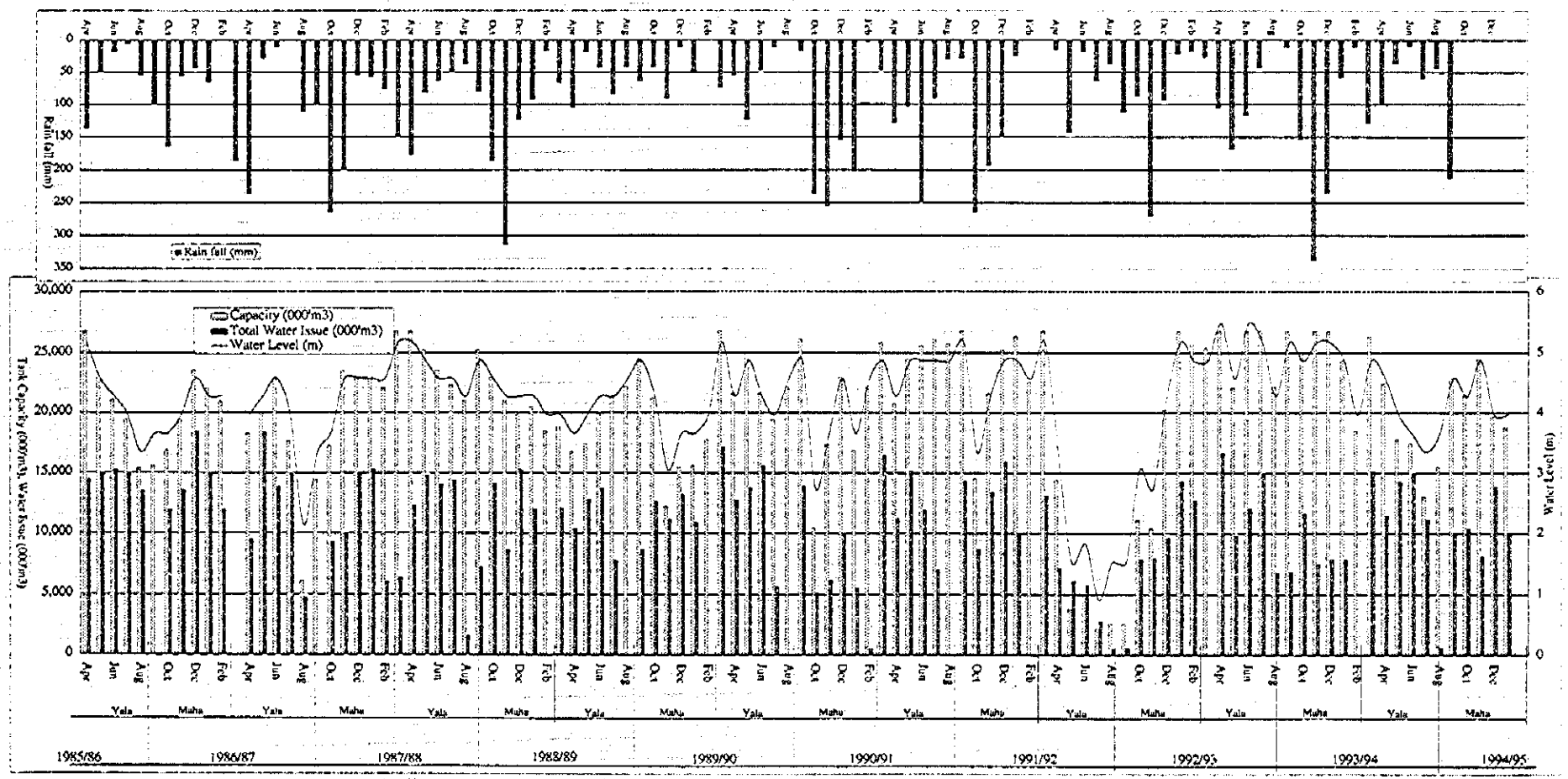


Fig. 5.2.1-2 Water Issue Records of Ridiyagama Tank (1986 Apr ~ 1995 Jan)

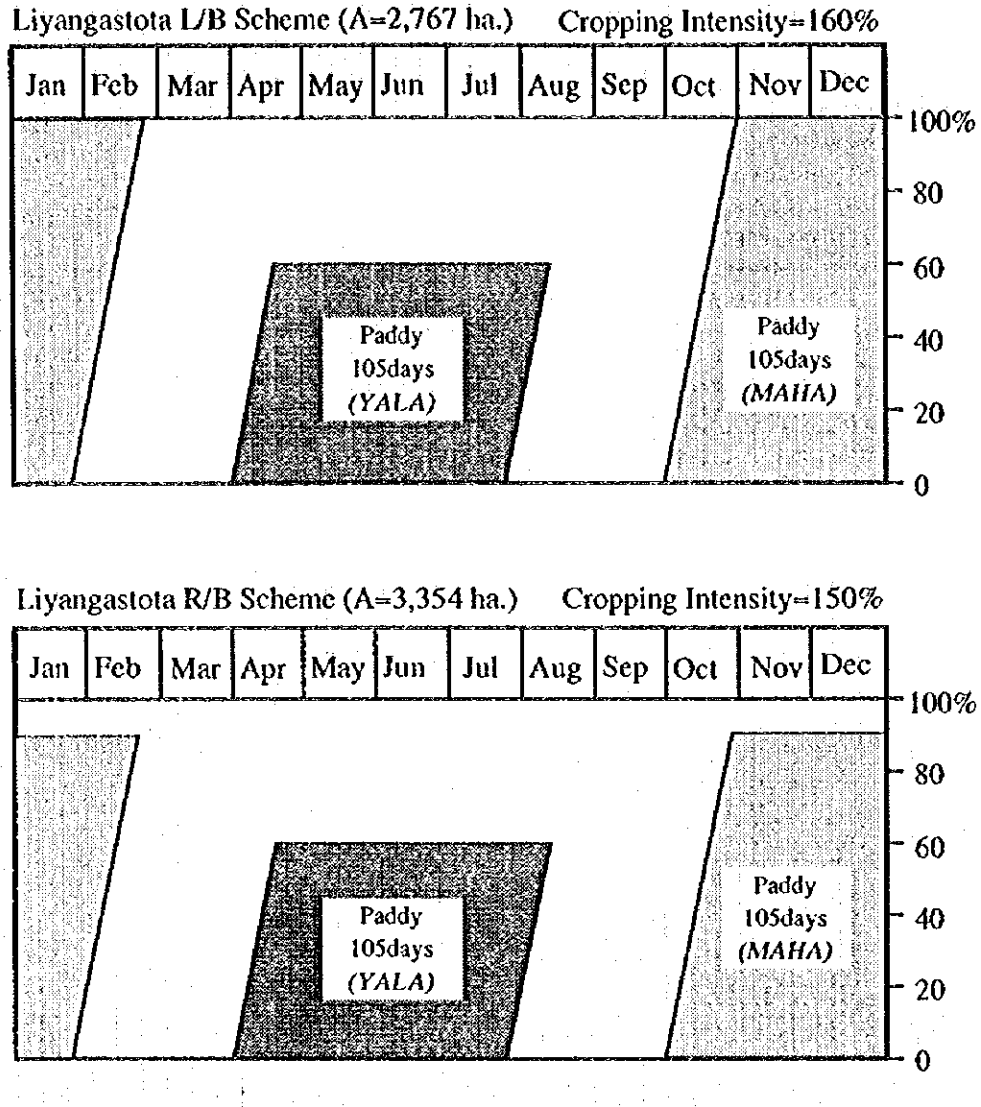


Fig. 5.2.1-3 Present Cropping Pattern for Liyangastota Scheme

5.2.2 Agriculture

(1) Land Use and Farm Family

Land Use

Total paddy land cropped area in 94 Yala and 94/95 Maha is estimated at 9,458 ha in paddy with 155% of cropping intensity for the irrigable area identified as the study team and ID: 6,121 ha in total.

Upland or non-paddy crop area including homestead counts 2,900 ha in total, which is used for tree crops such as coco-nuts or fruits and OFC in chili, onion, vegetable, etc.

Farm Family

Numbers of farm families both of land owners and tenant farmers are estimated at 4,850, cultivating 1.1 ha of paddy on the average.

According to the report by Ambalantota AGA Division, classes in land holding size are 18% below 0.4ha, 48% between 0.4 and 1.2 ha, and 34% above 1.2ha. The holders above 1.2 ha usually lend a part of paddy land to tenant farmers with 14 bushel(300kg) per Ac(0.4ha) of tenancy rate.

Tenancy size is mostly 1 Ac(0.4ha). The ratio of tenant land in paddy cultivation occupies 45% in Maha and 51% in Yala in Hambantota district (Agricultural Statistics of Sri Lanka 1992).

(2) Crop Cultivation and Cropping Pattern

Paddy Cultivation

Land preparation, threshing are done by machinery. According to the questionnaire survey, the machinery cost occupies 38% of production cost in cash outlay. The following cost is fertilizer occupying 27% of the cost. They use 375kg/ ha for 3.4 t/ ha of the yield. This seems to be over-use and agro-chemicals are also dosed much more than the other schemes.

Yield standard is estimated at 3.4 t/ ha on the average.

OFC Cultivation

The OFC ratio in paddy land is minimal in farmers leaders survey.

Cropping Pattern

The present cropping pattern in Liyangastota scheme is supposed as follows.

Season	Present		
	Crops	CI (%)	Benefitted Area (ha)
Yala	Paddy	60	3,672
Maha	Paddy	94.8	5,786
Total		154.8	9,458

3) Livestock and Tree Crops

Livestock

Hambantota Veterinary Service Center reported 14,000 heads of cattle and 18,000 heads of buffaloes at Ambalantota AGA division in 1993.
Goats and poultry can be seen in some farm houses, but there were no available data.

Tree Crops

According to Coconuts Cultivation Board at Ambalantota, about 600 ha of upland at Liyangastota area is used for coconuts cultivation with about 90,000 trees by approximately 5,000 farm families.

Besides coconuts trees, there are fruit crops such as banana, papaya, jack-fruits, mango, bread-tree, etc. mainly in the homestead.

(4) Agricultural Support Service

Agricultural extension in this scheme is carried out by one AO and two AI under an inter-provincial Assistant Director under central DOA. 30% of seed paddy is provided by Agrarian Service Center, and 40% of paddy production is sold to Paddy Marketing Board.

5.2.3 Farmer Organizations

Liyangastota has two PMC for the LB and RB respectively working more or less independently. On the LB there are 24 farmer organizations at the DCO level representing 194 field canal groups (FCG) with a total membership of 1,308 farmers. This represents about 78% of the total farming community in the LB area. The FOs were formed in the early part of 1992 with the help of Institutional Organizers from IMD. Currently the IMD Project Manager of Kirindi Oya scheme functions as chairman of the PMC and as Project Manager. He normally visits the scheme once a week and more frequently when required. PMC and DCOs hold meetings every month to discuss and decide on operational matters. FOs are actively involved in water management, input supplies and marketing activities.

On the RB there are 30 FOs at the DCO level with a total membership of 1,526 representing around 64% of the total farming community. The farmers were organized in 1992. The PMC is chaired by the Irrigation Engineer Ambalantota who functions as Project Manager in addition to his substantive duties. The Project Manager is in the process of establishing 3 subproject committees to manage different parts of the scheme. Here too farmers participate in water management and related functions.

In both LB and RB FOs have been able to mobilize their members to contribute their labour and other resources through "Shramadana" to maintain the system at times including the main system especialy when ID is short of funds for maintenance.

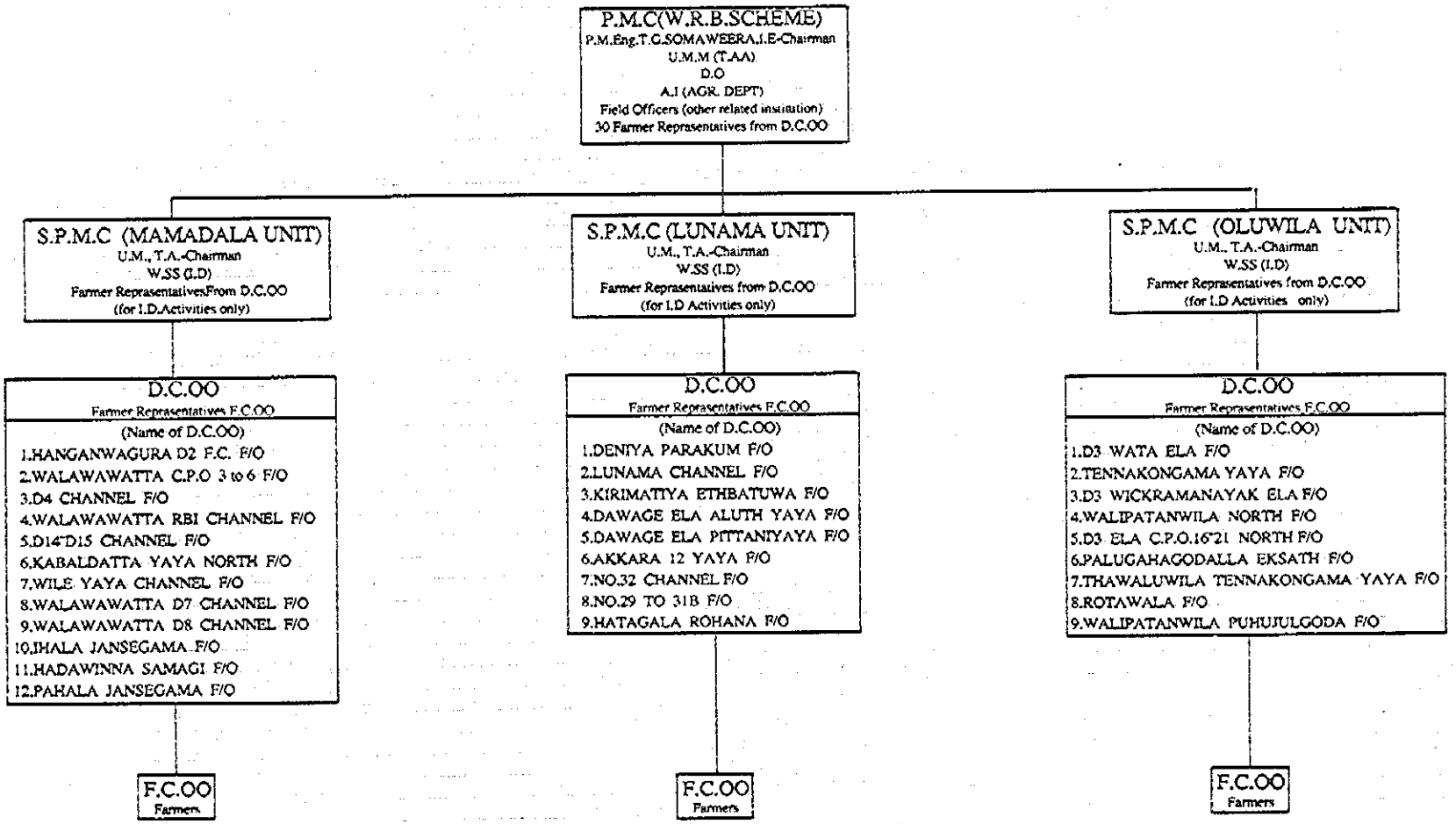
The FOs though active in water management and participating in the PMC's decision making have not as yet developed adequately to take on other development activities. FOs do handle ID contracts for system mainenance.

Farmers have not as yet taken over the maintenance of the D canals but have expressed their willingness to do so after rehabilitation. All farmer representatives joined actively in the discussion of the WLAC meetings in providing information about the rehabilitation requirements and system management.

Table 5.2.3-1 and Fig. 5.2.3-1 present the current organization of the PMC.

Table 5.2.3-1 Project Management Committee of Liyangastota-Left Bank (Ridiyagama)

Name of F.O.	Area of Authority	Extent Acres	Number of Members-hip	Number of Farmers
1. Gamini	SLB Gallawila, SLB Hakuranmulla	237.0	84	109
2. Samagi	SLB Uda Beragama, SLB Mahara, SLB Arawanamulla	190.0	81	93
3. Mahanaga	Kokunawila Yaya, RB01, 5ft. Canal, Main Canal	201.0	50	59
4. Gajaba	Godaganna Canala	82.0	59	82
5. Alakbar	NRB LB4A	105.0	30	35
6. Isuru	No. 1 Pipe, No.4 Pipe	128.0	42	54
7. Pragathi	Pipe near Delgaha, SLB Middle Portion	123.0	38	38
8. Ekamuthu	Modarapiliwala	61.0	30	40
9. Kavantissa	NCB Gamvishala, NCB Boralukanda, NCB Karawilayaya	521.0	150	177
10. Perakum	Kadawaraya, Eswandumayaya	250.5	90	113
11. Gotabhaya	SRB Aragas Ara Amuna & Paibokka amuna	37.5	20	31
12. Wijaya	SLB RB 04	183.0	60	73
13. Eksath	SRB RB 01, 02	166.0	42	56
14. Senanayaka	SRB LB 01, 02, 03	169.0	53	64
15. Saruketha	SRB LB01, LB02, LB03	277.0	82	99
16. Weera	NRB Laaipe Canal, NRB 3ft. Ela, NRB Punchihena Wila	238.0	79	86
17. Neela	LB01, NCB LB01, Padiliyaya,5ft. Ela	52.5	49	67
18. Ruhunu	LB02, 03, 5ft. Ela Lower Section	265.0	51	82
19. Pubudu	NCB Poliyarwatta	115.5	41	47
20. Dimuthu	Lolugaha Anicut, Lower Section	179.5	50	63
21. Suhada	NRB LB08, NRB 30Ac.& 90Ac. Anicut	337.5	84	92
22. Walawa	SRB Canal	232.0	128	138
23. Mahasen	SLB 8A	72.0	25	34
24. Theraputta	SRB RB03	114.0	30	39
Total			1,448	1,771



Note: S.P.M.C is not yet implemented, it is proposed to implement in near future.

Fig. 5.2.3-1 LIYANGASTOTA FOs Organization Chart

5.2.4 Management of System

In both R.B and L.B the Project Management Committees are responsible for the overall water allocation and management. System deterioration results in over issue and heavy waste of water. In also leads to flooding in the lower reaches.

ID staff operate the main system and D.C. Gates, FOs manage the internal distribution. Tail-enders especially face water shortages. FOs seems to co-operate actively with ID and the PMC to make the best use of the available water.

In all of the above schemes FOs have taken an active interest in water management and maintenance of the D.CC and F.CC. FOs also organize 'Shramadana' (voluntary labor) for weeding, desilting, and earthwork in the D.Canal and small farmer groups maintain the field canals. Since the systems are badly deteriorated and the O&M funds available to ID is very limited, farmers have to put in extra effort to maintain the system; at times farmers have to maintain parts of the main system. FOs undertake maintenance contracts from ID. They are agreed that this is more cost effective and helps to achieve a higher standard of maintenance with limited funds.

Operation and Maintenance Costs

O/M costs for the Scheme were allocated by ID as follows:

R.B

Year	Allocation (Rs.)	Area (ha)	Rs./ha
1991	709,000	3,282	216
1992	1,055,000	"	321
1993	1,227,000	"	374
1994	1,270,000	"	387

L.B

Year	Allocation (Rs.)	Area (ha)	Rs./ha
1991	604,000	2,767	218
1992	899,000	"	324
1993	1,045,000	"	381
1994	1,083,000	"	391