DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

MINISTRY OF MAHAWELI DEVELOPMENT

THE STUDY ON EXTENSION OF THE MORAGAHAKANDA AGRICULTURAL DEVELOPMENT PROJECT

UPDATING THE FEASIBILITY STUDY

VOLUME-II ANNEX

PHASE-I

MAY 1988

JAPAN INTERNATIONAL COOPERATION AGENCY

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REPORT

ABBREVIATIONS

CB	Central Bank of Sri Lanka
CEB	Ceylon Electricity Board
CECB	Central Engineering Consultancy Bureau
CISIR	Central Institute for Scientific and Industrial Research
DA	Department of Agriculture
DCS	Department of Census and Statistics
FAO	Food and Agriculture Organization - United Nations
FD	Forest Department
GDP	Gross Domestic Product
GNP	Gross National Product
GOJ	Government of Japan
GOSL	Government of Sri Lanka
IBRD	International Bank for Reconstruction and Development (World Bank)
ID	Irrigation Department
IDB	Industrial Development Board
JICA	Japan International Cooperation Agency
MADR	Ministry of Agricultural, Development and Research
MASL	Mahaweli Authority of Sri Lanka
MEA	Mahaweli Economic Agency
MECA	Mahaweli Engineering and Construction Agency
MFP	Ministry of Finance and Planning
MLLD	Ministry of Lands and Land Development
MMD	Ministry of Mahaweli Development
MTI	Ministryof Trade and Industries
NCDZ	North Central Dry Zone
NCP	North Central Province
NCRB	North Central River Basin
NWDZ	North-Western Dry Zone
RVDB	River Valley Development Board
SEDZ	South-Eastern Dry Zone
SD	Survey Department
UNDP	United Nations Development Programme
WMP	Water Management Secretariat
GA	Government Agent Division

AGA	Assistant Government Agent Division
GS	Grama Sevaka Division
T&V	Training and Visit System
KVS	Kursi Vapthi Sevaka (GS level instructor)
CRCS	Comprehensive Rural Credit Scheme
MPCS	Multi-Purpose Co-operative Societies
ASC	Agrarian Service Centre
NCRCS	New Comprehensive Rural Credit Scheme
AI	Agricultural Instructor
PMB	Paddy Marketing Board
MRKFED	Co-operative Marketing Federation
FCD	Food Commissioner's Department
CWE	Co-operative Wholesale Establishment

REPORT

MGDP	Master Plan of Mahaweli Ganga Development Project (UNDP/FAO, 1968)
AMDP	Accelerated Mahaweli Development Programme (NEDECO, 1977)
ISS	Implementation Strategy Study (NEDECO, 1978)
HCP	Hydrological Crash Programme (NEDECO, 1981)
TDS	Transbasin Diversion Study (Electrowatt, 1981 & 1984)
MWRMP	Mahaweli Water Resources Management Project (ACRES, 1986)

ABBREVIATIONS OF MEASUREMENT

Length

mm = Millimeter
cm = Centimeter
m = Meter
km = Kilometer
ft = Foot
yd = Yard

Area

cm^2 = sq.cm = Square centimeter
m^2 = sq.m = Square meter
ha = Hectare
km^2 = sq.km = Square kilometer

Volume

cm^3 = cu.cm = Cubic centimeter
l = lit = liter
kl = Kiloliter
m^3 = cu.m = Cubic meter
gal. = Gallon
MCM = Million Cubic Meters

Weight

mg = Milligram
g = Gram
kg = Kilogram
ton = Metric ton
lb = Pound

Time

sec = s = Second
min = Minute
h = Hour
d = Day
y = Year

Electrical Measures

V = Volt
A = Ampere
Hz = Hertz (cycle)
W = Watt
kW = Killowatt
MW = Megawatt
GW = Gigawatt

Other Measures

% = Percent
PS = Horsepower
° = Degree
' = Minute
" = Second
°C = Degree centrigrade
10^3 = Thousand
10^6 = Million
10^9 = Billion (milliard)

Dirived Measures

m^3/s = m^3/sec = Cubic meter per second
cusec = Cubic feet per second
mgd = Million gallon per day
kWh = Kilowatt hour
MWh = Megawatt hour
GWh = Gigawatt hour
kWh/y = Kilowatt hour per year
kVA = Kilovolt ampere
BTU = British thermal unit

Money

Rs. = Sri Lanka Rupees
US$ = US dollar
Yen = Japanese Yen

CONVERSION FACTORS

	From Metric System			To Metric System		
Length	1 cm	=	0.394 inch	1 inch	=	2.54 cm
	1 m	=	3.28 ft = 1.094 yd	1 ft	=	30.48 cm
	1 km	=	0.621 mile	1 yd	=	91.44 cm
				1 mile	=	1.609 km
Area	1 cm^2	=	0.155 sq.in	1 sq.ft	=	0.0929 m^2
	1 m^2	=	10.76 sq.ft.	1 sq.yd	=	0.835 m^2
	1 ha	=	2.471 acres	1 acre	=	0.4047 ha
	1 km^2	=	0.386 sq.mile	1 sq.mile	=	2.59 km^2
Volume	1 cm^3	=	0.0610 cu.in	1 cu.ft	=	28.32 lit
	1 lit	=	0.220 gal. (imp.)	1 cu.yd	=	0.765 m^3
	1 kl	=	6.29 barrels	1 gal. (imp.)	=	4.55 lit
	1 m^3	=	35.3 cu.ft	1 gal. (US)	=	3.79 lit
	10^6 m^3	=	811 acre-ft	1 acre-ft	=	1,233.5 m^2
Energy	1 kWh	=	3,413 BTU	1 BTU	=	0.293 Wh
Temperature	°C	=	(°F-32) 5/9	°F	=	1.8°C + 32
Derived Measures						
	1 m^3/s	=	35.3 cusec	1 cusec	=	0.0283 m^3/s
	1 kg/cm^2	=	14.2 psi	1 psi	=	0.703 kg/cm^2
	1 ton/ha	=	891 lb/acre	1 lb/acre	=	1.12 kg/ha
	10^6 m^3	=	810.7 acre-ft	1 acre-ft	=	1,233.5 m^3
	1 m^3/s	=	19.0 mgd	1 mgd	=	0.0526 m^3/s

EXCHANGE RATE

US$1.0 = J. Yen 140.0 = Rs. 30.5

ANNEX - A

GENERAL ECONOMY

ANNEX - A

GENERAL ECONOMY

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ANNEX-A GENERAL ECONOMY

A.1 ADMINISTRATION

Sri Lanka is located in a tropical zone which extends from 5.5° to 9.5° north latitude and from 79.4° and 81.5° east longitude and only 29 km away from India across Palk Strait. Total land area of the country is 65,510 km^2. The main land is about 430 km at the longest part from north to south and about 220 km from east to west. Regarding administrative structure, Sri Lanka is divided into Provinces, the Provinces into the Government Agent divisions which are called GA or District, the District into Assistant Government Agent (AGA) divisions, and AGA into Grama Sevaka (GS) divisions.

The Moragahakanda agricultural project area is located in the central zone of the east coast. It occupies an gross area of 118 x 10^3 ha, comprising 100 x 10^3 ha or 85% of North Central Province and 18 x 10^3 ha or 15% of Eastern Province. It also consists of two Districts, i.e., Polonnaruwa and Trincomalee. The former is in North Central Province and the latter is in Eastern Province. The project area, furthermore, is divided into seven AGA divisions as of 1987, i.e. (1) Elahera, (2) Sinhala Pattuwa, (3) Lankapura, (4) Medirigiriya, (5) Tamankaduwa, (6) Kinniya and (7) Kantalai. The first five AGA divisions belong to Polonnaruwa District and the other two AGA divisions to Trincomalee District.

There are 53 Grama Sevaka divisions which are related to the Project. They are broken down as follows: 6 GS divisions in AGA Elahera division; 13 in Sinhala Pattuwa; 11 in Lankapura; 9 in Medirigiriya; 10 in Tamankaduwa; 3 in Kantalai; and 1 in Kinniya. It should be noted that these numbers are as of the 1981 census year. In this study, the characteristics of the project area would be captured by figures or indicies of Polonnaruwa District because of data availability and because 85% of the project area is located in the District.

A.2 POPULATION

A.2.1 Population

Sri Lanka had a population of 16,117 x 10^3 in 1986 according to the provisional estimation of the Central Bank of Sri Lanka, corresponding to the density of 245 persons/km^2. The growth in population was about 1,086 x 10^3 as compared with 1981 census, i.e., the average growth rate was 1.66% per annum during the period from 1981 to 1986, as shown in Table A.2.1. This growth rate was a little high by 0.08% as compared with that for two census years between 1971 and 1981. A population projection, which was carried out in a general report of the "Census of Population and Housing 1981" (Ref. 2) by the Department of the Census and Statistics, shows that the population of Sri Lanka in the year 2001 would reach between 20.0 x 10^6 and 21.3 x 10^6, corresponding to the annual growth rate of 1.43% and 1.76% per annum. Using the provisional estimation of the Central Bank, if the average annual growth rate of 1.66% for the period from 1981 to 1986 may be applied to the forecast of population in the future, the population of Sri Lanka is expected to be 20.6 x 10^6 by the year 2001.

Polonnaruwa District, where 85% of the project area is included, had a population of 294 x 10^3 in 1986, corresponding to the density of 91 persons/km^2. The growth during both periods of 1971/1981 and 1981/1986 is 98 x 10^3 and 32 x 10^3, i.e., the average annual growth rates are 4.80% and 2.33%, respectively. These growth rates were much higher than the national ones. In particular, the growth rate of 4.80% during the period from 1971 to 1981 was quite high. According to the Census Report, a rate of natural increase in the District was 2.7% during the period. Therefore, 48 x 10^3 was caused by in-migration increase. This fast growth might be brought about by agricultural development in the Mahaweli river basin and other settlement projects.

A.2.2 Labour Force

The population between 15 and 54 years old in the years 1971, 1981 and 1986 was 6,586 x 10^3, 8,225 x 10^3 and 8,904 x 10^3 respectively, as shown in Table A.2.1. According to the table, labour force was estimated at 5,093 x 10^3 in 1981 and therefore labour participation rate was 34.3%. Since unemployment population was estimated at 594 x 10^3, an unemployment rate was 11.7% in 1981. "Public Investment 1987-1991" issued by National Planning Division says that though the unemployment rate was recorded at 14% in 1985, it is forecasted to rise to 19% by 1989 if radical measures are not adopted to spur industrial growth.

Percentage of workers employed in the agricultural sector such as agriculture, livestock, fishery and forestry in the country was about 45.5% of the number of whole workers in 1981 or decreased by about 4.5% as compared with the 1971 percentage. Share of the agricultural sector to the whole industry had a tendency to decrease. On the contrary, there was an observable tendency to increase in shares of industrial and services' sectors. This might be reflection of the govrnment development policy of employment in the field of manufacturing, services and tourism.

A.3 ECONOMIC CONDITIONS

A.3.1 Gross Domestic Product

The Gross Domestic Product (GDP) of Sri Lanka was estimated at Rs. 163.7 x 10^9 in 1986 and Sri Lanka economy has achieved a stable economic development for the recent five years from 1982 to 1986, as shown in Tables A.3.1 and A.3.2. Such a stable growth is largely due to the expansion of the agricultural sector, although the production in 1984 went down because of weather conditions. The share of the agricultural sector to the total GDP, however, kept almost the same level of arround 27% during the period. The leading growth sectors of the economy in the period were manufacturing sub-sector (average growth rate of 6.6% per annum), electricity, gas and water-supply sub-sector (6.6%), and the services' sector (5.4%) during the period.

Per capita GDP was estimated at Rs. 10,157 (about US$360) in 1986. Its real growth attained to 3.3% as an average annual rate during the period.

A.3.2 Agricultural Sector

Agriculture plays an important role in the Sri Lanka economy in terms of contributions to GDP, export earnings and employment as mentioned before. Characteristics of agricultural production in Sri Lanka is summed up as follwos:

(1) Agricultural sector is mainly divided into two sub-sectors such as plantation sub-sector and other crop production sub-sector.

(2) Plantaion sub-sector is specialized into three major crops such as tea, rubber and coconut, which are important export products for Sri Lanka;

(3) Other crop production sub-sectors produce food crops such as rice, upland crops and vegetables for domestic consumption;

(4) Livestock is still backward in the national ecenomy, which is mainly carried on in the homesteads and/or is raised for land cultivation; and

(5) Fishery production is gradually increasing in both coastal fishing and inland fishing, but its productivity is still low because of primitive and petty farming.

Rice is the staple food for Sri Lanka people, so it is one of the most important crops. Rice cultivation occupies one-fifth of the arable land. As shown in Table A.3.3, paddy production reaches 2,588 x 10^3 tons in 1986, attaining to self-sufficiency in the near future. The extent cultivated, yield and total production of paddy have shown an upward trend in a recent decade, due to the provision of irrigation facilities, improved seed varieties, extension services, fertilizer and pricing policy. In these days, other crops such as vegetables including onion, chillies, and soyabean are expected to be promoted for domestic consumoption and to help coordinate import and production activities.

A.3.3 Industrial and Services' Sectors

Manufacturing sub-sector plays one of leading roles in Sri Lanka economy. Between 1982 and 1986 the real average annual growth rate on manufacturing sub-sector has mostly exceeded the avarage annual growth rate in GDP, as shown in Table A.3.2. The average percentage share of manufacturing to GDP during the same period is 14.5% varing between a low of 14.0% in 1983 and a high of 15.2% in 1986,as shown in Table A.3.1. In particular, (a) textiles and garments, and (b) food, beverages and tobacco industries might perform a considerable contribution to GDP growth during the period, as shown in Table A.3.4.

The services' sector also contributes to GDP growth during the period. Relatively high rates are observed in the sub-sectors of (a) transportation and communication and (b) other services, which record average annual growth rates of 5.8% and 5.9%, respectively.

A.3.4 Public Finance

Government fiscal performance reflects the economic development policy of the government which is to attain an increase of both employment opportunities and family incomes in order to improve living standard in the country. Thus, the fiscal performance has shown the following conspicuous characteristics for recent years, as shown in Table A.3.5:

(1) The expenditure has increased since 1977 and kept the high level of the ratio of expenditure to GDP. In these years, the ratio of capital expenditure to GDP kept more than 18% except in 1984, which was about 9% in 1977.

(2) To meet the budget deficit, the government finance has been depending on domestic and foreign loans. However, owing to retrenchment in the expenditure in a recent few years, the ratio of net cash deficit to GDP has declined year by year except in 1985. Recognizing these budgetary constraints, the government makes an effort to commit economic development policy, reducing in the budget deficit and overcoming the economic exerting pressure on prices and balance of payments.

Table A.3.5 shows the size of Mahaweli investment in the government fiscal performance during the period from 1982 to 1986. Mahaweli investment had the peak amount of Rs. 7,313 x 10^6 in 1982 and thereafter went down to Rs. 4,716 x 10^6 in 1986. The ratio of Mahaweli investment to the government capital expenditure was recorded at 40% in the peak year of 1982.

A.3.5 Prices

One of the serious economic problems in Sri Lanka is a price increase. Since 1978, the Colombo Consumer's Price Index has increased at the rate of more than 10% per annum, though it went down to 1.5% in 1985. In 1986, however, the index recorded a shaper increase than that in 1985 again. The price increase is thought to be caused mainly

by the following economic characters: (1) high degree of dependence upon imports; and (2) upward trend of subsidized consumer commodities and public utility prices because of retrechment in the government expenditure.

Wholesale price index has also recorded a high increase rate since 1978. In 1985, however, the index declined by 15.2% and in 1986 also it went down by 3.0%. These declines were caused by the drop in export prices of tea and coconut products which are major contributory factors towards the wholesale price declines. As a result, the wholesale price increase rate for five years 1982-1986 was about 6.6%, as shown in Table A.3.6.

In 1986, wages in both agricultural work and construction work recorded around 5% increase, which is more stable than before. Increase of wages before 1983 was induced by a consequance of the steeper rise in prices, because wage increases come out after rises in prices, in general.

A.3.6 Foreign Trade

Foreign trade is one of the most important economic activities for the Sri Lanka economy. This is reflecting the economic structure, i.e., (a) plantation products such as tea, rubber and coconuts are important articles for export, which attained to Rs. 15.0×10^9 or 46.3% of the total export in 1986 including some minor crop, as shown in Table A.3.7 and (b) Sri Lanka can not help importing some consumer goods, intermediate goods and investment goods because of characteristics of the nationl economic structure. Since 1977, foreign trade rapidly has increased because of the implementation of import liberalization policy. Therefore, Sri Lanka economy is sensitive to foreign trade trend. The flactuation of international price of agricultural products, particularlly tea, rubber and coconuts, directly influences the national economy.

In export component of Sri Lanka, the plantation products have played an important role but their share to total export has gradually decreased. Especially, the trade amount of tea export is so slow in increase for these years because of competitive world market, except 1984 and 1985. On the other hand, industrial products, textile and garment in particular, have grown to major export articles. Its share reaches to the same level as the agricultural export, as shown in Table A.3.7.

In import goods compornent, the share of consummer commodities, rice in particular, are going down because of self-sufficiency endeavour, as shown in Table A.3.8. On the other hand, intermediate goods, petronium in particular, get a big share in total import. Investment goods has grown at a high growth rate because of development policy of the government.

A.4 DEVELOPMENT PLANS

"Public Investment 1987-1991" is only a plan which is functioning as national development policy in Sri Lanka. The public investment programme is a rolling plan and is revised every year. The programme 1987-1991 is the latest virsion, published in May 1987. Intergrated regional development plans are now being conducted under the assistance of the World Bank and other organizations. The Moragahakanda project area, however, is outside of the integrated plans, though it was included in the Public Investment 1986-1990 published in 1986. Therefore, there is no integrated development plans related to the project area.

In the public investment programme, the following perspective during the medium term from 1987 to 1991 is invisaged to accelerate the growth of the economy:

(1) The government budget will continuously be serious because financial resources are vulnerable due to unstable export commodity prices and because budgetory expenditure has to increase on security in the country. Thus, the private sector will be promoted to move actively in areas which creates employment and earn foreign exchange through export oriented production or efficient import substitution. For the sake of that, the government provides necessary incentives and infractructure facilities.

(2) Although the policy emphasizes the necessity for retreching in the expenditure and for stabilizing social issues in the short run, the basic policy in the long run will still forcus on the issues of structural transformation. Any available resources for new projects will be allocated in accordance with the government policy.

(3) During the period, the following production is expected to grow the national economy from the point of view of fair contribution to GDP: (a) agricultural production from paddy, sugar and livestock; (b) industrial production from textile, garments, food, beverages, tobacco, wooden products, paper and rubber products; and (3) services.

(4) The government still make an effort to improve employment opportunity. Its objectives, however, would be to promote productive employment rather than to create jobs merely aimed at redistributing incomes. Then, in rural area in particular, the following activities would be promoted to provide a number of productive job opportunities: agriculture, handicrafts and livestock. Since most of these activities are managed by the basis of self-employment, the government will provide encouragement and official support for them.

(5) In this context, GDP is expected to grow at an average growth rate of 4.6% per annum during the period from 1987 to 1991, as shown in Table A.4.1. The each economic sector is expected to grow at the following annual rates: (a) 3.0% in agricultural sector; (b) 5.0% in industrial sector; and (c) 5.3% in services' sector. In construction sub-sector, the growth rate of 4.9% takes into account of the trends in downstream developoment in Mahaweli in particular.

(6) Domestic prices are expected to move moderately. The average inflation rate is likely to be lower than what was experienced in the past 9 years. Since the average inflation rate was 8.4% annum during the 9 years, it would be expected to be less than 8% per annum.

REFERENCES

No.	Title	Issued on	Issued by
001	Statistical Abstract of the Democratic Socialist Republic of Sri Lanka 1985	Jan. 1987	Dept. of Census and Statistic MPI
002	Census of Population and Housing 1981 Population Data for Words and Grama Sevaka Divisions		Dept. of Census and Statistic MIP
003	Review of the Economy 1986		Central Bank of Sri Lanka
004	Economic & Social Statistics of Sri Lanka	Dec. 1986	Central Bank of Sri Lanka
005	Report on Consumer Finances and Socio Economic Survey 1981/1982 Sri Lanka Part I	Oct. 1984	Central Bank of Sri Lanka
006	Public Investment 1987-1991	May 1987	National Planning Division MFP

TABLES

Table A.2.1 POPULATION BY SEX, URBAN/RURAL RESIDENT AND LABOUR FORCE: 1971, 1981 AND 1986

Item	Population (10^3) in Census Year			Percentage Distribution (%)			Average Growth Rate	
	1971	1981	1986/1	1971	1981	1986	71/86	81/86
I. Sri Lanka								
1. Population	12,690	14,847	16,117	100.0	100.0	100.0	1.58	1.66
2. Male	6,531	7,568	8,215	51.5	51.5	51.5	1.48	1.65
3. Female	6,159	7,279	7,902	48.5	49.0	49.0	1.68	1.66
4. Urban	2,848	3,195	-	22.4	21.5	-	1.16	-
5. Rural/2	9,842	11,652	-	77.6	78.5	-	1.70	-
6. 15-54 Years old	6,586	8,225	8,904	51.9	55.4	55.2	2.25	1.60
7. Labour Force	-	5,093/3	-	-	34.3	-	-	-
8. Gainful workers	-	4,499/3	-	-	30.3	-	-	-
9. Unemployment	-	594/3	-	-	4.0	-	-	-
Unemployment rate (%)	-	11.7	-	-	-	-	-	-
II. Polonnaruwa District	164	262	294	1.3	1.8	1.8	4.80	2.33

Note: /1 Provisional figure by Central Bank of Sri Lank
/2 Include estate population
/3 Labour participation rate of 34.3% and percentage distribution of equipment is quoted from ref.005

Source:Ref.001, 003 and 004

Table A.2.2 POPULATION EMPLOYED BY INDUSTRIAL SECTOR: 1971 AND 1981

Insustrial Sector	Population (10^3)		Percentage (%)		Average Annual Growth Rate (%)
	1971	1981	1971	1981	
Agriculture	1,829	1,876	50.1	45.5	0.3
Industry	466	593	12.8	14.4	2.4
- Mining & Quarrying	13	34	0.4	0.8	9.9
- Manufacturing	339	409	9.3	9.9	1.9
- Construction	104	134	2.8	3.3	2.6
- Elec., Gas & Water	10	16	0.3	0.4	5.2
Services	1,040	1,281	28.5	31.1	2.1
- Transport and Communication	179	200	4.9	4.8	1.1
- Trade	344	437	9.4	10.6	2.4
- Others	517	644	14.2	15.6	2.2
Not-specified	314	369	8.6	9.0	1.6
Total	3,649	4,119	100.0	100.0	1.2

Source:Ref.002

Table A.3.1 GROSS DOMESTIC PRODUCT AT CURRENT PRICES: 1982 - 1986

Industrial Group	GDP (Rs. 10^6)					Percentage Distribution (%)				
	1982	1983	1984	1985	1986	1982	1983	1984	1985	1986
Agricultural Sector	24,964	32,180	40,138	41,069	44,355	26.4	28.3	28.7	27.7	27.1
- Agriculture & Livestock	20,771	27,110	35,051	35,599	37,889	21.9	23.8	25.0	24.0	23.1
- Forestry	1,710	1,907	2,199	2,530	3,087	1.9	1.7	1.6	1.7	1.9
- Fishing	2,483	3,163	2,888	2,940	3,379	2.6	2.8	2.1	2.0	2.1
Industrial Sector	24,887	29,992	36,856	38,859	43,547	26.3	26.3	26.3	26.2	26.6
- Mining & Quarrying	2,238	2,799	3,153	3,328	4,155	2.3	2.5	2.2	2.2	2.5
- Manufacturing	13,601	15,958	20,890	21,849	24,868	14.4	14.0	14.9	14.7	15.2
- Construction	7,959	9,807	11,180	11,640	12,272	8.4	8.6	8.0	7.9	7.5
- Elec., Gas and Water	1,089	1,428	1,633	2,042	2,252	1.2	1.2	1.2	1.4	1.4
Services Sector	44,828	51,706	63,045	68,393	75,810	47.4	45.4	45.0	46.1	46.3
- Transport & Communication	10,666	12,554	15,499	16,554	17,911	11.3	11.0	11.1	11.2	11.0
- Trade	19,694	21,759	27,192	29,261	31,808	20.8	19.1	19.4	19.7	19.4
- Others	14,468	17,393	20,354	22,578	26,091	15.3	15.3	14.5	15.2	15.9
GDP	94,679	113,878	140,039	148,321	163,712	100.0	100.0	100.0	100.0	100.0
GDP per Capita (Rs.)	6,233	7,387	8,977	9,365	10,157	-	-	-	-	-

Source:Ref.003

Table A.3.2 GROSS DOMESTIC PRODUCT AT 1982 CONSTANT PRICES: 1982 - 1986

Industrial Group	GDP (Rs. 10^6)					Annual Growth Rate (%)				
	1982	1983	1984	1985	1986	82/83	83/84	84/85	85/86	82/86
Agricultural Sector	24,964	26,212	26,113	28,366	29,106	5.0	-0.4	8.6	2.6	3.9
- Agriculture & Livestock	20,771	21,868	22,300	24,504	25,037	5.3	2.0	9.9	2.2	4.8
- Forestry	1,710	1,816	1,889	1,923	1,958	6.2	4.0	1.8	1.8	3.4
- Fishing	2,483	2,528	1,924	1,939	2,111	1.8	-23.8	0.8	8.9	-3.9
Industrial Sector	24,887	25,323	27,108	28,062	29,770	1.8	7.0	3.5	6.1	4.6
- Mining & Quarrying	2,238	2,413	2,449	2,486	2,615	7.8	1.5	1.5	5.2	4.0
- Manufacturing	13,601	13,710	15,390	16,193	17,558	0.8	12.3	5.2	8.4	6.6
- Construction	7,959	8,039	8,030	8,070	8,191	1.0	0.0	0.5	1.5	0.7
- Elec., Gas and Water	1,089	1,161	1,239	1,313	1,406	6.6	6.7	6.0	7.1	6.6
Services Sector	44,828	47,840	51,174	53,142	55,385	6.7	7.0	3.8	4.2	5.4
- Transport & Communication	10,666	11,281	12,437	12,959	13,377	5.8	10.2	4.2	3.2	5.8
- Trade	19,694	20,738	22,029	22,925	23,821	5.3	6.2	4.1	3.9	4.9
- Others	14,468	15,821	16,708	17,258	18,187	9.4	5.6	3.3	5.4	5.9
GDP	94,679	99,375	104,395	109,570	114,261	5.0	5.1	5.0	4.3	4.8
GDP per Capita (Rs.)	6,233	6,446	6,692	6,919	7,089	3.4	3.8	3.4	2.5	3.3

Source:Ref.003

Table A.3.3 PRODUCTION OF MAJOR CROPS: 1978, 1982 AND 1986

Item	Unit	Production			Average Annual Growth Rate (%)	
		1978	1982	1986	78/82	82/86
I. Major Export Crops						
Tea	10^6 kg	199	188	211	-1.40	2.93
Rubber	10^6 kg	156	125	138	-5.38	2.50
Coconut	10^6 nuts	-	2,521	3,039	-	4.78
II. Minor Export Crops						
Cinnamon	10^3 ton	26	32	14	5.33	-18.66
Pepper	10^3 ton	17	18	9	1.44	-15.90
Cocoa	10^3 ton	12	14	6	3.93	-19.08
III. Food Crops						
Paddy	10^3 ton	1,891	2,156	2,588	3.33	4.67
Manioc	10^3 ton	499	638	397	6.30	-11.17
Potatoes	10^3 ton	30	65	103	21.32	12.20
Red Onions	10^3 ton	72	93	72	6.61	-6.19
Maize	10^3 ton	35	45	41	6.48	-2.29
Chillies	10^3 ton	28	27	38	-0.90	8.92
Cowpea	10^3 ton	23	36	20	11.85	-13.66

Source:Ref.003

Table A.3.4 MANUFACTURING PRODUCTION: 1982 AND 1986

(Unit: Rs. million at Current Prices)

Category	Value of Production		Value Added		Increment	
	1982	1986	1982	1986	Value	Times
1. Food Beverages and Tobacco	5,246	12,129	2,259	6,850	4,591	3.0
2. Textiles & Garments	3,863	12,088	488	3,104	2,616	6.4
3. Wood Products	361	632	134	393	259	2.9
4. Paper Products	725	1,289	257	626	369	2.4
5. Chemicals	13,099	11,088	1,927	2,705	778	1.4
6. Non-metallic Products	1,370	2,053	862	1,117	255	1.3
7. Basic metal Products	262	281	14	37	23	2.6
8. Machinery & Transport Equipment	904	1,757	790	1,116	326	1.4
9. Not specified	74	136	29	71	42	2.4
Total	25,904	41,453	6,760	16,019	9,259	2.4

Source:Ref.003

Table A.3.5 GOVERNMENT FISCAL PERFORMANCE: 1982 - 1986

(Unit: Rs. million at Current Prices)

Item	1982	1983	1984	1985	1986
1. Current Receipt	17,809	25,210	37,731	39,010	41,644
2. Recurrent Expenditure	20,110	23,963	28,926	33,842	34,772
- Mahaweli Development	192	301	1,508	1,851	708
3. Advance Account	-879	1,120	2,916	314	-170
4. Recurrent Account (1)-(2)+(3)	1,422	127	5,889	4,854	7,042
5. Capital Expenditure	18,669	21,733	21,750	30,529	35,112
- Mahaweli Development	7,313	6,952	5,568	5,385	4,716
6. Budget Deficit	20,091	21,606	15,861	25,676	28,070
7. Debt Repayment	2,612	5,025	2,229	6,897	7,529
8. Net Cash Deficit	17,479	16,580	13,632	18,779	20,541
9. Public Debt Outstanding	71,250	86,423	95,741	123,720	150,276
10. Share of Capital Expenditure to GDP (%)	18.8	17.9	14.1	18.8	19.6
11. Share of net cash Deficit to GDP (%)	18.5	14.6	9.7	12.7	9.2

Source:Ref.003

Table A.3.6 PRICE INDECIES AND WAGE ESCALATION: 1982 - 1986

Item	Index/Price					Percentage Change (%)					
	1982	1983	1984	1985	1986	1982	1983	1984	1985	1986	82/86
I. Price Index (1982 = 100)											
1. Consumers Price Index (In Colombo Consumers' Price Index)	100.0	114.0	132.9	134.9	145.6	10.8	14.0	16.6	1.5	7.9	9.8
2. Wholesale Price Index	100.0	125.0	156.0	133.1	129.0	5.5	25.0	25.6	-15.2	-3.0	6.6
3. Construction Cost Index (Housing Construction)	100.0	105.1	115.7	124.5	125.0	4.6	7.1	11.7	7.7	0.7	5.7
4. Implicit Deflator	100.0	114.6	134.1	135.4	143.3	-	14.6	17.0	1.0	5.8	9.4
II. Producer Price (Rs.)											
1. Paddy (kg)	3.48	3.67	3.75	3.95	4.02	5.8	5.5	2.2	5.3	1.8	3.7
2. Curry Chillies (kg)	4.97	5.71	7.02	7.13	7.78	10.0	14.9	22.9	1.6	9.1	11.9
3. Red Onions (kg)	6.71	6.66	21.11	11.94	11.88	-11.8	-0.7	217.0	-43.4	-0.5	15.4
4. Banana (each)	0.58	0.67	0.75	0.75	-	5.5	15.5	11.9	0.0	-	-
III. Retail Prices of Agricultural Input											
1. Seed Paddy (Improved: Bushel)	81.60	86.65	93.41	95.14	98.95	5.7	6.2	7.8	1.9	4.0	4.8
2. Seed Paddy (Traditional: Bushel)	77.43	83.35	87.83	88.44	92.31	4.5	7.6	5.4	0.7	4.4	4.5
3. Urea (50 kg)	145.79	155.43	152.25	152.30	156.41	22.4	6.6	-2.0	0.0	2.7	1.8
4. C.P.D (50 kg)	146.50	155.90	159.63	158.59	156.94	22.6	6.4	2.4	-0.7	-1.0	1.7
IV. Daily Wage Rate (Rs.)											
1. Paddy Farming											
- Transplating	27.30	34.41	34.86	36.76	38.66	10.3	26.0	1.3	5.4	5.2	9.1
- Harvesting	29.43	34.97	37.51	39.15	41.52	7.8	18.8	7.3	4.4	6.1	9.0
- Threshing	33.17	41.02	41.26	41.32	43.48	3.1	23.7	0.6	0.1	5.2	7.0
2. Construction (Masonry)											
- Master	52.42	58.31	63.50	68.39	72.30	14.2	11.2	8.9	7.7	5.7	8.4
- Skilled Helper	35.65	39.98	43.83	47.03	49.60	13.0	12.1	9.6	7.3	5.5	8.6
- Unskilled Helper	26.34	30.11	33.11	35.37	37.36	10.6	14.3	10.0	6.8	5.6	9.1

Source: 004

Table A.3.7 COMPONENT OF EXPORT: 1978, 1982 AND 1986

Item	Amount (Rs. million)			Percentage Distribution			Average Annual Growth Rate (%)	
	1978	1982	1986	1978	1982	1986	78/82	82/86
1. Agricultural Export	10,117	11,656	14,984	76.6	54.3	46.3	3.60	7.84
- Tea	6,401	6,342	9,253	48.5	29.6	27.2	-0.22	9.90
- Rubber	2,021	2,323	2,622	15.3	10.8	7.7	3.54	3.07
- Coconut	972	1,496	1,609	7.4	7.0	7.0	11.38	1.84
- Minor Crops	723	1,495	1,500	5.5	6.9	4.4	19.92	0.08
2. Industrial Export	2,475	8,271	15,878	18.7	38.6	46.6	35.21	17.71
- Textile & Garments	481	3,502	9,629	3.6	16.3	28.3	64.26	28.77
- Petroleum Products	945	3,280	2,358	7.1	15.3	6.9	36.49	-7.91
- Others	1,049	1,489	3,891	7.9	6.9	11.4	9.15	27.14
3. Mineral Export	-	859	1,182	-	4.0	3.5	-	8.31
- Gems	531	685	755	4.0	3.2	2.2	6.57	2.46
- Others	-	174	427	-	0.8	1.3	-	25.16
4. Un-classified	-	668	1,249	-	3.1	3.7	-	16.94
Total	13,206	21,454	34,072	100.0	100.0	100.0	12.90	12.26

Source:Ref.004

Table A.3.8 COMPONENT OF IMPORT: 1978, 1982 AND 1986

Item	Amount (Rs. million)			Percentage Distribution			Average Annual Growth Rate (%)	
	1978	1982	1986	1978	1982	1986	78/82	82/86
1. Consumer Goods	5,618	8,601	18,609	38.3	20.5	34.1	11.24	21.28
- Rice	689	925	1,052	4.7	2.2	1.9	7.64	3.27
(Quantity 1,000 t)	(-)	(174)	(231)				(-)	(7.34)
- Flour	-	62	90	-	0.1	0.2	-	9.76
- Sugar	620	970	1,764	4.2	2.3	3.2	11.84	16.13
(Quantity 1,000 t)	(-)	(134)	(322)				(-)	(24.51)
- Textile and Clothin	531	2,167	6,353	3.6	5.1	11.6	42.13	30.85
2. Intermediate Goods	5,591	5,286	13,179	38.1	51.6	40.9	40.26	0.77
- Wheat	-	3,502	9,629	-	4.2	4.3	-	7.31
(Quantity 1,000 t)	(-)	(495)	(681)				(-)	(8.30)
- Fertilizer	252	560	1,282	1.7	1.3	2.3	22.09	23.01
- Chemical	446	729	1,587	3.0	1.7	2.9	13.07	21.47
- Petroleum	2,403	12,274	6,293	16.4	29.3	11.5	50.33	-15.37
3. Investment Goods	3,367	1,159	10,556	27.6	27.6	19.3	36.21	-2.30
4. Un-classified	110	114	3,130	0.3	0.3	5.7	0.90	128.91
Total	14,687	41,946	54,609	100.0	100.0	100.0	30.00	6.82

Source:Ref.003 and 004

Table A.4.1 GDP BY INDUSTRIAL ORIGIN AT 1985 CONSTANT PRICES: 1985 - 1991

Industrial Origin	GDP (Rs. million)				Annual Growth Rate (%)				Average Annual Growth Rate (%)
	1985	1986	1987	1991	1985	1986	1987	1991	86/91
Agriculture	41,069	41,563	41,058	48,084	27.7	26.9	25.7	24.9	11.24
- Paddy	9,379	9,004	7,724	10,299	6.3	5.8	4.8	5.3	7.64
- Tea	5,269	5,203	5,269	5,540	3.5	3.4	3.3	2.9	-
- Rubber	1,164	1,172	1,202	1,244	0.8	0.8	0.8	0.6	11.84
- Coconut	3,342	3,414	2,954	3,461	2.3	2.2	1.8	1.8	
- Other	21,915	22,770	23,908	27,541	14.8	14.8	15.0	14.2	42.13
Industry	36,817	38,120	39,769	48,626	24.8	24.7	24.9	25.1	40.26
- Mining & Quarrying	3,328	3,397	3,594	4,766	2.2	2.2	2.2	2.5	-
- Tea, Rubber, Coconut Processing	5,646	5,604	5,636	5,947	3.8	3.6	3.5	3.1	22.09 13.07
- Other Industries	16,203	17,013	17,864	22,551	10.9	11.0	11.1	11.7	
- Construction	11,640	12,106	12,675	15,362	7.8	7.8	7.9	7.9	50.33
Services	70,435	74,661	78,991	96,743	47.5	48.4	49.4	50.0	36.21
GDP	148,321	154,344	159,818	193,453	100.0	100.0	100.0	100.0	0.90

Source:Ref.006

ANNEX - B

METEOROLOGY AND HYDROLOGY

ANNEX - B

METEOROLOGY AND HYDROLOGY

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ANNEX-B METEOROLOGY AND HYDROLOGY

B.1 METEOROLOGY

B.1.1 General

The project area is located around 7° North in latitude and characterized by tropical monsoon with the dry and rainy seasons; north-eastern monsoon period (November to March), and south-east monsoon period (April to September).

The Mahaweli Project Area is divided into three climatic zones. The dry zone is defined as the area where annual evaporation is exceeding the annual rainfall. The wet zone is defined as the area where the annual rainfall is exceeding 2,000 mm and the intermediate zone is a transition zone between the wet zone and dry zone.

The meteorological observation has been carried out at Anuradhapura, Maha-Illuppallama and Trincomalee and other gauging station as illustrated in Fig B.1-1 and the general features of climatic conditions are shown in Tables B.1.1 to B.1.3.

The average annual rainfall is approximately 1,650 mm (65 inches) at the Hingurakgoda meteorological station (1950-1977 records), located in the central part of the project area. About 75% of annual rainfall occurs during the north-east monsoon period and the balance during the south-west monsoon period. The fluctuations of annual rainfall are considerably large, ranging from 2,830 mm (111 inches) to 970 mm (38 inches).

The mean temperature at the Maha-Illuppallama meteorological station shows little variation throughout the year, ranging from 25°C to 28°C. The annual mean relative humidity is about 80% with little fluctuation between 75% in September and 88% in December. North-east winds prevail in the Maha season (rainy season from October to March) and south-west winds in the Yala season (dry season from April to September). The monthly average of daily maximum wind velocity ranges from 5.5 km/hr in November to 16.4 km/hr in June.

Mean annual evaporation is over 2,000 mm (80 inches) at Maha-Illuppallama,which is represented the characteristic of the climate of the project area. The monthly mean pan evaporation ranges from 120 mm (4.8 inches) in November to 230 mm (9 inches) in July. Potential evaporation is estimated to be 1,850 mm (73 inches) on an annual average.

B.1.2 Rainfall

Although 225 rainfall stations are available in Sri Lanka, taking continuation of the record and distance from the project site into account, following four gauging stations were considered to represent rainfall in the project site:

Station	Area
1) Bakamuna (Elahera)	Morahakanda dam site, and G
2) Polonnaruwa	D2
3) Hingurakgoda	D2
4) Kantalai	A/D
5) Maha-Illuppallama	Meteorological Station

Based on the 28 years rainfall record (1950-1977), average annual rainfalls in Bakamuna, Polonnaruwa, Higurakgoda and Kantalai are recorded at 1,671 mm, 1,859 mm, 1,648 mm and 1,596 mm, respectively as shown in Tables B.1.4 to B.1.7.

According to the rainfall data at Hingurakgoda, 75% of rainfall is concentrated in the Maha season (October to March). The monthly rainfall varies widely from approximately 10 mm in June and 440 mm in December as shown in Table B.1.8.

B.1.3 Air Temperature

The air temperature is observed in the Anuradhapura, Maha-Illuppallama and Trincomalee meteorological stations for 30 years and 23 years and 30 years, respectively, as shown in Tables B.1.1 to B.1.3.

In order to grasp climatic conditions of the project area, the observations at the Maha-Illuppallama meteorological station were used as the representative of the project area because of the nearest station, and continuity and reliabilities of records. Average, monthly mean temperature varies in the narrow range from 25°C to 28°C as shown below:

Unit: °C

Month	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Mean Air Temperature	25	26	28	28	28	28	28	28	27	26	26	26	27

B.1.4 Pan-Evaporation

Near the project area, evaporation has been measured with the standard A-pan at four stations as listed in Table B.1.9.

Annual average evaporation of these stations is within a range from 1,450 mm to 1,930 mm.

Evaporation value from water surface of tank or reservoir can be estimated by applying pan coefficient, which is the ratio of evaporation from A-pan and evaporation from tank or reservoir. Though pan coefficient varies seasonally or with the depth of water, average value is around 0.75. As variation of pan coefficient would little influence to the water balance study of the Moragahakanda Reservoir, the evaporation from the Reservoir and tanks is assumed at 75% of A-pan value at Kalawewa station, which is the closest to the project area. Average annual evaporation from reservoir or Tank surface was estimated at 1,428 mm as shown in Table B.1.10.

B.1.5 Relative Humidity

As stated in the previous Sub-section, the relative humidity is also observed at Maha-Illuppallama meteorological station. The average relative humidity is 75% varying from 83% in December to 68% in September as shown in B.1.11 and Fig.B.1-2.

B.2 HYDROLOGY

B.2.1 River Basin

The Mahaweli Ganga originates from Nuwara Eliya which is the hilly area in the Central Province of the Sri Lanka, flows down 330 km north-east direction and reaches Koddiyar bay near Trincomalee. The catchment area of the Mahaweli river at the river mouth is 10,500 km^2. At the 80 km upstream from estuary, the Amban Ganga joins to the Mahaweli Ganga. The catchment areas at Elahera and Angamedilla anicuts are 779 km^2 and 1,363 km^2, respectively.

The river basin in the project area is divided into two basins, its own basin of the Amban Ganga and the Mahaweli Ganga basin, which is connected through the Polgolla diversion tunnel completed in 1975. The Amban Ganga flow augmented by the Polgolla diversion is once impounded at the Bowatenna reservoir. A part of regulated water is diverted from the Bowatenna reservoir to Kalawewa region so-called Systems H, IH and MH areas with an irrigation area of 48,600 ha, located in the other basins. Further diversion is made for the Nalanda reservoir about 10 km upstream of the Bowatenna reservoir to Dewahuwa area with an irrigation area of 1,220 ha in another basin.

Downstream of the Bowatenna reservoir, there are two existing intake weirs at Elahera and Angamedilla. Intake water at Elahera anicut is led to the existing fields in Systems G and D1 through Elahera-Minneriya canal which links four existing tanks, Minneriya, Giritale, Kaudulla and Kantalai. Water diverted at Angamedilla anicut is impounded at the Parakrama Samudra tanks and the regulated water is supplied to the existing fields in System D2.

B.2.2 Runoff the Mahaweli Ganga at Polgolla

The Mahaweli Ganga has a catchment area of 1,292 km^2 at the Polgolla diversion weir site. The Gurudeniya gauging station located at about 16 km downstream is the nearest one. Discharges at Polgolla were estimated based on the runoff records at Gurudeniya by multiplying the conversion factor 0.961, which is estimated by the ratio between catchment area at Polgolla and Gurudeniya. The monthly runoff at Polgolla from 1950 to 1977 is shown in Table B.2.1 The average annual runoff at Polgolla was estimated to be 2,430 MCM (77 m^3/sec) on an average form 1950 to 1977. The variations of annual runoff were so large, ranging from 1,332 MCM (42 m^3/sec) in 1976 to 3,356 MCM (106 m^3/sec) in 1957 The average monthly runoff at Polgolla (1950-1977) is shown below:

Average Monthly Runoff at Polgolla

Unit: MCM

Jan	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
116	70	64	107	199	299	273	249	239	321	284	218	2,438

B.2.3 Polgolla Diversion

The construction of the Polgolla diversion tunnel and the Bowatenna dam and irrigation tunnel permitted the water to be diverted into the Amban Ganga and the Kala Oya from the Mahaweli Ganga.

As formulated in the previous Feasibility Study in 1979, the same diversion policy was followed at this stage. In the diversion policy of the UNDP/FAO Master Plan, the maximum diversion capacity of the Polgolla tunnel was limited to 56.6 m^3/sec (2,000 cusec) and the minimum downstream release to 4.25 m^3/sec (150 cusec). Based on the above policy, the average annual diversion was estimated to be 1,282 MCM, ranging from 963 MCM in 1976 to 1,513 MCM in 1960.

After completion of the Kotmale reservoir, the regulated flow at Polgolla has been available to increase Polgolla diversion, if the UNDP/FAO policy might be applicable i.e. the minimum downstream release of 4.25 m^3/sec (150 cusec). Possible average annual diversion at Polgolla is augmented from 1,282 MCM in case without Kotmale to 1,538 MCM with Kotmale. The average monthly diversion is shown in Table B.2.2 and details in ANNEX-H.

B.2.4 Runoff of the Amban Ganga

The Amban Ganga is the biggest tributary of the Mahaweli Ganga originating from a mountain slope at 1,300 m in altitude about 12 km southeast of Matale town, it flows 50 km northward to the existing Bowatenna dam, then 25 km eastward to Elahera and then about 45 km northeastward and it flows into the Mahaweli main stream at its 80 km upstream from the estuary. Total length of the river is 123 km down to the confluence with the Mahaweli Ganga.

The Amban Ganga has a catchment area of 782 km^2 at the proposed Moragahakanda damsite. Only one gauging station on the Amban Ganga is the Elahera station located at about 2 km upstream of the damsite with a catchment area of 779 km^2. Runoff records at the Elahera station were adopted as the runoff at the proposed damsite without any correction, since the difference in both catchment areas is negligible. The average annual natural runoff was 776 MCM (25 m^3/sec). The runoff record at the gauging station is shown in Table B.2.3.

At Angamedilla with about 1,363 km^2 of catchment area, the average annual natural runoff was estimated to be about 1,440 MCM (46 m^3/sec), ranging from 775 MCM (25 m^3/sec) in 1974 to 2,363 MCM (75 m^3/sec) in 1977, which was estimated by NEDECO as shown in Table B.2.4.

The average annual natural runoffs (1950-1977) at the proposed damsite and Angamedilla are summarized below:

Runoff of Amban Ganga

Unit: MCM

Location	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annum
Elahera (Dam Site)	142	88	49	46	43	26	24	21	20	54	98	167	776
Angamedilla	272	162	97	89	75	43	48	34	37	89	172	322	1,440

B.2.5 Flood Discharge at Moragahakanda Dam Site

Since river gauging records of the Amban Ganga at Elahera have been recorded during low flows stage, the results of flood analysis for Bowatenna dam were utilized for the estimation of flood runoff at the Moragahakanda dam site. On purpose to compare with UNDP/FAO results, the probable flood runoffs at the dam site was calculated by applying the results of flood analysis for Bowatenna dam. The peak discharges of both results are as summarized below.

Unit: m^3/sec

Return Period	Estimated Flood Runoff	UNDP/FAO
20	2,080	2,505
50	2,865	3,000
100	3,262	3,481
500	3,990	4,415
1,000	4,624	4,981

For the safe design, the estimated flood runoff by UNDP/FAO was adopted for the feasibility design of the Moragahakanda dam. Accordingly, flood discharge at the proposed damsite was estimated to be about 3,480 m^3/sec for a return period of 100 years and about 3,880 m^3/sec for a return period of 200 years. Since the flood conveyance capacity of the downstream of the Mahaweli Ganga is limited, the swamp areas in lowland are created and might be subject to periodic inundation even though the series of dams on the Mahaweli Ganga have been completed, but such inundation be decreased.

B.2.6 Runoff of the Residual Area

In the project area, there are five tanks; Minneriya, Giritale, Kaudulla and Kantalai linked by the Elahera-Minneriya canal, and Parakrama Samudra. Each existing tank has its own catchment basin, the runoff from which is important water resources for the development of the area. However, there were no reliable runoff records on these existing tanks. NEDECO has estimated natural runoff to each existing tank taking into account rainfall, catchment area, topography and vegetation. (Ref. to ISS; Implementation Strategy

Study in 1978). As the NEDECO data were considered the most reliable at the previous study state, assessment of natural runoff to the tanks were based on them. In NEDECO data, however, the catchment areas of the Gal Oya 215 km^2 and Aluth Oya 73 km^2 were disregarded in the estimate of the Kantalai tank inflow as well as the area along the Elahera Minneriya canal 145 km^2 in the estimation of the Minneriya tank inflow. Therefore, the runoffs from these catchment areas were also counted by using ratios of catchment areas.

B.2.7 Sedimentation

The UNDP/FAO Master Plan Report has recommended to employ total sediment yield of 334 m^3/km^2 (0.70 ac.ft/sq.mile) for reservoir designs. The report has also indicated a sedimentation diagram of the Mahaweli basin on the following assumptions:

- Annual total sediment yield would be 0.70 ac.ft/sq.mile and annual yields for both suspended load and bed load would be the same,
- In the case water is to be diverted to another basin, only suspended load would be diverted with water in proportion to the amount of water diverted, and no bed load would be diverted, and
- The trap efficiency would be calculated for each reservoir according to the empirical curve obtained by C.M. Brune.

The sedimentation diagram on the Moragahakanda Reservoir is as shown in Fig. B.2-2.

At the Bowatenna reservoir, about 50% of suspended load would deposit, and two-thirds of the balance would be flushed out to the Amban Ganga. then, the volume of sediment deposit of the Moragahakanda Reservoir is estimated at 15 x 10^6 m^3 (11,600 ac.ft) for 100 years.

Sediment measurements were carried out at Elahera and Gurudeniya gauging stations for both suspended load and bed load transport. According to the records a total annual sediment yield in 1978 by JICA estimated at 95 m^3/km^2 (0.2 ac.ft/sq.mile) and 22 m^3/km^2 (0.47 ac.ft/sq.mile) at Elahera and Gurudeniya, respectively. The values were much less than the value recommended by the UNDP/FAO.

For the conservative design, the design sediment deposition of the Moragahakanda Reservoir was decided at 15 x 10^6 m^3 based on the value recommended by the UNDP/FAO.

B.2.8 Quality of Water

The detailed water quality analysis were carried out for the water of Mahaweli Ganga, Amban Ganga and the existing tanks located in North Central Province by United States Operation Mission (USOM) in 1960 to 1961.

The electrical conductivity of the water showed less than 475 micro-mhos/cm at any time and places. The water was classified in C1 of C2 by the criteria of U.S. Salinity Laboratory. Water Sodium Adsorption Ratio (SAR) was less than 10 which was classified into S1 by the said criteria.

From the above classification, it was concluded that the water is suitable for the irrigation purpose in view of salinity and alkalinity.

TABLES

Table B.1.1 GENERAL FEATURE OF THE CLIMATIC CONDITIONS AT ANURADHAPURA

Climatological Table of Observatories in Sri Lanka

Station: ANURADHAPURA Lat: 08°21'N Long: 80°12'E Barometer: 305ft. Anemometer: - I=0830 S.L.S.T. II=1730 S.L.S.T.

Month		Mean Sea Level Pressure	Dry bulb temp.	Relative humidity	Mean daily max. temp.	Mean daily min. temp.	Highest max. temp. recorded	Lowest min. temp. recorded	Mean wind speed at hour	Mean daily wind speed	Prevailing wind direction	Monthly rainfall	Number of rainy days	Rainfall driest month	Rainfall wettest month	Heaviest rainfall in 24 hrs.	No. of hrs. of sunshine per day	Cloudiness (Oktas)	No. of days of thunder	No. of days of fog
		mb.	°C	%	°C	°C	°C	°C	kmph.	kmph.		mm.		mm.	mm.	mm.				
January	I	1013.4	23.3	91	28.6	20.7	36.5	13.0	4.8	6.0	NE	123.2	12	0.8	537.5	166.4	7.0	4.4	1	0
	II	1010.2	26.4	73			1919.9	1950.3	8.0		NE			1916	1922	1963.6		4.7		
February	I	1012.6	23.9	89	30.7	20.7	37.1	13.3	4.7	6.3	E	53.6	6	0	195.1	136.9	7.8	3.6	2	0
	II	1009.2	28.3	64			1916.28	1957.7	7.9		ENE			11 yrs.	1922	1922.12		4.2		
March	I	1012.2	25.9	85	33.2	21.9	38.6	14.1	6.8	5.6	E	98.6	7	0	357.4	119.4	8.3	3.0	6	0
	II	1008.3	30.3	60			1915.1	1935.1	7.2		E			1988 & 1910	1936	1919.19		4.1		
April	I	1010.5	27.4	84	33.3	23.6	38.1	18.1	5.3	5.2	SW	186.9	13	13.2	457.7	156.8	8.4	3.9	12	0
	II	1008.9	29.4	71			1914.24	1950.1	6.1		W			1911	1890	1955.19		5.9		
May	I	1008.2	27.5	83	32.2	24.6	38.0	20.2	11.6	10.1	SW	99.6	8	0	493.3	160.8	7.9	5.8	5	0
	II	1005.5	29.2	71			1933.2	1935.11	10.8		SW			3 yrs.	1891	1932.14		5.7		
June	I	1008.4	27.3	79	32.2	24.7	37.2	21.3	14.2	13.5	SW	13.5	4	0	126.3	72.6	7.9	6.2	0	0
	II	1006.1	29.1	66			1915.18	1912.5	15.1		SW			10 yrs.	1885	1906.10		5.7	0	
							1933.1													
July	I	1008.5	26.8	78	32.7	24.3	38.3	20.8	13.2	12.7	SW	31.8	3	0	208.0	94.0	7.7	6.0	2	0
	II	1006.1	29.0	64			1918.22	1949.19	13.2		SW			24 yrs.	1910	1938.31		4.3		
August	I	1008.8	26.9	77	33.0	24.2	38.2	20.0	13.5	12.7	SW	46.7	5	0	217.9	110.7	7.4	5.9	5	0
	II	1006.0	29.1	63			1912.10	1939.10	13.2		SW			8 yrs.	1965	1965.15		5.9		
September	I	1009.2	26.9	77	33.4	24.0	38.4	20.5	12.9	11.8	SW	89.8	5	0	348.2	99.1	7.8	5.7	5	0
	II	1006.6	28.9	62			1914.17	1935.15	12.2		SW			8 yrs.	1929	1914.19		5.8		
October	I	1010.8	26.1	83	31.8	23.1	37.4	18.4	8.2	7.7	SW	232.9	16	52.1	567.1	132.8	6.4	5.7	11	0
	II	1007.7	27.4	73			1918.1	1928.28	7.6		SW			1870	1902	1924.24		6.2		
							1957.13													
November	I	1012.2	25.1	89	29.9	21.9	34.8	14.1	4.2	4.5	Calm	248.4	19	45.7	593.6	130.6	6.2	5.0	8	0
	II	1009.2	26.3	80			1916.5	1934.13	5.0		NE			1904	1920	1920.23		6.7		
December	I	1012.7	23.8	91	28.5	21.3	33.1	14.1	5.0	5.6	NE	242.3	17	62.5	927.1	319.5	5.9	5.0	2	0
	II	1009.7	25.8	79			1972.10	1937.6	6.8		NE			1886	1957	1948.31		5.4		
Annual	I	1010.7	25.9	84	31.7	23.9	38.6	12.2	8.5	8.5		1447.3	115	243.2	2426.5	319.5	7.4	5.0	66	0
	II	1007.6	28.3	69					9.6					1956	1957			5.5		
Period of Date(Years)		22	25	25	30	30	65	65	25	24	10	30	30	105	105	25	5	25	10	10

Table B.1.2 GENERAL FEATURE OF THE CLIMATIC CONDITIONS AT MAHA-ILLUPPALLAMA

Climatological Table of Observatories in Sri Lanka

Station: MAHA ILLUPPALLAMA Lat: 08°07'N Long: 80°25'E Barometer: 452ft. Anemometer: 10ft. I=0830 S.L.S.T. II=1730 S.L.S.T.

Month		Mean Sea Level Pressure	Dry bulb temp.	Relative humidity	Mean daily max. temp.	Mean daily min. temp.	Highest Max. temp. recorded	Lowest Min. temp. recorded	Mean wind speed at hour	Mean daily wind speed	Prevailing wind direction	Monthly rainfall	Number of rainy days	Rainfall driest month	Rainfall wettest month	Heaviest rainfall in 24 hrs.	No. of hrs. of sunshine per day	Cloudiness (Oktas)	No. of days of thunder	No. of days of fog
		mb.	°C	%	°C	°C	°C	°C	kmph.	kmph.		mm.		mm.	mm.	mm.				
January	I	1013.2	23.2	85	29.1	20.4	33.3	15.4	6.9	7.2	NE	113.8	9	0	404.6	127.0	7.1	4.7	1	4
	II	1010.0	26.2	70			1935.29	1953.28	9.3		NE			2 yrs.	1971	1921.9		5.0		
February	I	1012.7	23.8	85	31.1	20.4	36.2	13.4	6.6	7.1	NE	51.3	5	0	230.1	107.9	8.4	3.8	2	2
	II	1009.2	28.1	67			1973.28	1954.13	9.3		NE			8 yrs.	1922	1957.4		4.3		
March	I	1012.0	25.2	82	33.4	21.2	38.1	15.9	6.4	6.3	Var.	89.7	6	5.6	295.0	106.7	9.0	3.2	8	4
	II	1008.1	30.2	57			1973.30	1961.1	9.0		NE			1941	1970	1920.5		4.3		
April	I	1010.5	26.8	82	33.4	23.2	38.6	19.8	5.8	5.3	Var.	162.9	11	7.1	455.7	143.8	8.7	4.1	17	1
	II	1007.0	29.3	69			1957.9	1944.30	7.9		Var.			1936	1921	1944.1		6.0		
May	I	1008.5	27.4	80	32.4	24.4	36.7	20.6	13.6	12.1	SW	99.3	7	0	342.0	171.7	8.2	5.6	5	0
	II	1005.9	28.8	71			1933.12	1971.20	13.4		SW			4 yrs.	1933	1922.1		5.9		
June	I	1008.6	26.9	78	32.2	24.4	37.1	21.0	17.4	16.4	SW	19.3	4	0	345.4	121.9	7.9	6.2	0	0
	II	1006.4	28.5	62			1953.11	1965.12	15.8		SW			7 yrs.	1917	1912.6		6.0		
July	I	1008.8	27.4	77	32.5	24.0	37.5	21.8	16.9	15.8	SW	30.2	3	0	212.4	92.7	7.7	6.1	7	0
	II	1006.5	28.3	65			1973.22	1963.26	12.5		SW			17 yrs.	1960	1960.11		6.0		
August	I	1009.1	26.6	75	32.9	24.0	36.3	19.9	17.1	15.8	SW	58.9	6	0	721.5	89.9	8.1	6.1	3	0
	II	1006.4	28.6	63			1953.6	1965.15	13.4		SW			14 yrs.	1933	1933.11		6.0		
September	I	1010.9	26.4	75	31.1	23.8	37.2	20.0	17.1	15.0	SW	66.3	4	0	360.4	148.8	7.2	5.8	5	0
	II	1008.9	28.5	62			1957.15	1943.13	16.3		SW			10 yrs.	1955	1975.13		5.8		
October	I	1010.9	26.0	81	31.2	22.4	35.0	19.5	13.0	8.9	SW	226.1	14	28.4	522.7	148.8	6.8	5.8	12	2
	II	1007.9	27.1	72			1954.18	1967.22	10.1		SW			1950	1962	1972.10		6.3		
November	I	1012.1	24.8	86	30.0	21.8	34.9	16.0	5.0	5.5	Var.	253.5	17	61.5	509.8	145.3	8.1	5.2	9	3
	II	1009.2	26.1	78			1973.20	1966.29	5.5		Var.			1969	1963	1972.28		6.2		
December	I	1012.7	23.9	91	29.7	21.1	33.2	15.6	6.4	6.5	NE	238.0	16	39.1	1027.4	175.9	5.6	5.3	3	3
	II	1010.2	25.4	79			1973.2	1955.5	7.9		NE			1974	1957	1907.15		5.8		
Annual	I	1010.8	25.5	82	30.5	22.1	38.1	13.4	10.0	10.2	-	1427.5	98	297.0	2598.4	175.9	7.6	5.1	65	19
	II	1007.8	27.9	68					11.9					1956	1957			5.6		
Period of data (Yrs.)		21	21	21	21	21	21	21	19	18	10	30	30	21	21	21	22	21	10	10

Table B.1.3 GENERAL FEATURE OF THE CLIMATIC CONDITIONS AT TRINCOMALEE

Climatological Table of Observatories in Sri Lanka

Station: TRINCOMALEE Latitude 8°35'N Longitude 81°13'E Barometer: 10ft. Above mean sea level. Period 1931-1960 S.L.S.T. 13:37:30 S.L.S.T.

Month		Mean Sea Level Pressure	Dry bulb temp.	Relative humidity	Mean daily max. temp.	Mean daily min. temp.	Highest temp. recorded	Lowest temp. recorded	Mean wind speed at hour	Mean daily wind speed	Prevailing wind direction	Monthly rainfall	Number of rainy days	Rainfall amount for month	Rainfall without month	Heaviest rainfall in 24 hrs.	No. of hrs. of sunshine per day	Cloudiness (Oktas)	No. of days of thunder	No. of days of fog
		mb.	°C	%	°C	°C	°C	°C	kmph.	kmph.		mm.		mm.	mm.	mm.				
January	I	1013.7	25.1	78	27.0	24.2	31.7	19.8	16.6	18.8	NE	210.6	13	0.8	238.6	209.5	6.6	5.4	0	0
	II	1010.6	26.2	76			1932.34	1950.3	20.4		NE			1973	1953	1931.9		5.8		
February	I	1013.2	26.2	77	28.3	24.3	34.3	18.3	12.4	15.3	NE	93.2	6	0	331.4	237.8	7.5	4.7	1	0
	II	1010.1	27.2	72			1915.26	1947.28	16.6		NE			6 yrs.	1943	1965.14		5.9		
March	I	1012.2	27.3	78	29.9	24.8	37.4	19.8	8.0	10.3	NE	68.3	5	0	232.4	232.0	6.8	3.8	3	0
	II	1009.8	28.6	71			1915.31	1941.5	12.3		WS			12 yrs.	1944	1944.1		4.1		
April	I	1010.7	28.5	77	32.0	25.6	38.6	20.9	7.9	10.3	SW	76.7	7	0	232.7	141.0	8.7	4.3	8	0
	II	1007.1	29.7	72			1936.25	1943.15	11.3		E			5 yrs.	1933	1955.16		5.2		
May	I	1008.0	28.9	72	33.6	26.1	38.3	18.6	16.2	16.2	SW	62.8	6	0	434.1	271.3	8.0	5.2	6	0
	II	1004.9	30.8	65			1915.25	1920.3	15.8		SW			1921 & 1936	1930	1930.3		5.9		
June	I	1007.6	28.6	70	33.7	26.2	38.3	20.6	21.1	21.6	SW	18.5	3	0	101.1	79.5	7.2	5.8	7	0
	II	1001.5	31.3	52			1953.2	1938.26	19.5		SW			23 yrs.	1973	1911.2		6.2		
July	I	1008.0	28.0	71	33.7	25.6	38.4	21.2	19.3	19.6	SW	56.1	4	0	219.2	99.6	7.3	5.1	4	0
	II	1005.1	30.5	59			1938.19	1933.3	15.3		SW			3 yrs.	1931	1936.12		4.1		
August	I	1008.3	27.7	71	33.5	25.3	37.8	20.6	18.8	18.4	SW	102.9	7	0.5	288.2	107.4	8.2	5.3	8	0
	II	1005.1	30.0	62			1969.12	1921.13	16.3		SW			1931	1909	1930.28		6.3		
September	I	1009.3	27.8	71	33.5	25.1	32.6	21.1	17.5	16.5	SW	88.9	6	3.0	269.3	128.5	7.8	5.2	8	0
	II	1003.8	29.7	65			1967.17	1911.17 & 1958.29	15.0		SW			1948	1901	1919.13		6.3		
October	I	1010.1	27.1	77	31.5	25.5	33.6	21.0	15.0	13.4	SW	234.7	14	15.2	565.1	134.1	6.9	5.3	10	0
	II	1007.3	28.1	73			1915.16	1931.8	13.4		NE			1924	1977	1932.3		6.5		
November	I	1011.9	25.4	81	28.3	23.8	35.9	18.7	10.8	13.8	SW	335.1	19	58.4	553.5	265.9	5.6	5.5	4	0
	II	1009.6	27.1	77			1922.2	1944.29	12.1		NNE			1923	1957	1904.19		6.2		
December	I	1012.9	25.9	80	27.3	24.0	32.6	19.4	12.0	15.4	W	373.4	18	56.4	819.9	372.8	5.5	5.9	2	0
	II	1009.9	26.2	78			1911.5 & 1915.8	1922.31	21.3		NNE			1930	1915	1949.17		6.3		
Annual	I	1010.5	27.4	75	31.0	24.9	38.7	18.3	14.9	15.0	-	1726.7	109	886.2	7578.4	322.8	7.4	5.2	56	0
	II	1007.3	28.8	69					14.3		-			1889	1943			5.8		
Period of data (yrs.)		30	25	25	30	30	45	45	25	30	10	30	30	102	102	85	10	25	10	

Table B.1.4 MONTHLY RAINFALL AT BAKAMUNA

* MONTHLY RAINFALL AT BAKAMUNA (ELAHERA)
* UNIT : INCH

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL	MAHA OCT-MAR	YALA APR-SEP
1950	6.38	5.24	5.32	1.29	1.88	0.00	0.00	0.25	0.84	2.95	6.14	8.34	38.63	34.37	4.26
1951	26.20	5.64	5.11	4.88	5.27	0.34	0.47	3.15	4.71	6.24	20.17	11.63	93.81	74.99	18.82
1952	17.21	6.70	0.95	8.32	4.33	0.00	0.73	0.00	5.67	3.89	7.37	14.34	69.51	50.46	19.05
1953	11.80	3.77	2.52	14.98	0.00	0.06	1.79	4.15	1.73	12.54	13.61	14.14	81.09	58.38	22.71
1954	15.54	5.26	12.08	8.49	0.00	0.00	0.99	3.18	0.00	8.28	5.84	20.73	80.39	67.73	12.66
1955	17.70	4.50	1.93	8.20	1.42	0.00	0.18	1.02	4.56	1.13	3.74	7.50	51.88	36.50	15.38
1956	7.42	2.97	3.51	3.57	0.00	0.00	0.00	0.00	0.00	1.92	20.93	25.42	65.74	62.17	3.57
1957	8.62	13.39	0.00	1.37	2.52	0.00	0.60	0.00	3.03	15.40	17.02	51.67	113.62	106.10	7.52
1958	6.83	4.50	8.73	4.99	3.75	0.00	0.08	0.00	0.00	2.20	5.50	12.60	49.18	40.36	8.82
1959	3.27	1.03	0.45	5.23	3.54	2.70	0.25	0.59	0.17	6.98	14.45	14.01	52.67	40.19	12.48
1960	11.08	23.55	0.14	15.75	0.68	0.00	2.73	0.00	0.06	3.40	19.09	8.07	84.55	65.33	19.22
1961	9.97	7.38	8.08	3.73	0.90	0.12	0.04	0.00	0.05	6.32	14.88	21.03	72.50	67.66	4.84
1962	14.21	1.44	0.94	10.74	3.75	0.00	0.04	1.58	0.04	7.69	7.78	10.81	59.02	42.87	16.15
1963	14.94	8.64	2.76	15.24	1.02	0.03	0.28	0.00	0.38	5.01	19.35	26.27	93.92	76.97	16.95
1964	11.05	4.64	1.50	7.37	3.16	0.00	6.93	0.35	1.52	11.31	4.34	8.41	60.58	41.25	19.33
1965	4.83	10.88	5.04	10.41	5.69	0.00	0.00	4.71	0.00	11.07	14.56	18.56	85.75	64.94	20.81
1966	16.60	0.82	5.72	4.40	0.00	0.00	0.00	0.71	2.25	13.38	11.31	9.53	64.72	57.36	7.36
1967	0.93	4.70	1.72	5.98	0.38	0.96	0.00	0.00	0.00	15.63	20.20	7.60	58.10	50.78	7.32
1968	6.16	0.00	9.87	2.46	0.00	0.00	0.00	0.00	0.00	8.88	11.98	8.40	47.75	45.29	2.46
1969	8.89	3.58	0.63	5.85	0.09	0.00	0.00	7.57	0.80	9.55	5.36	27.29	69.61	55.30	14.31
1970	18.79	23.61	4.17	4.79	0.85	0.00	0.00	0.00	2.01	4.77	11.36	12.68	83.03	75.38	7.65
1971	9.79	7.29	5.07	8.46	1.21	0.15	0.00	7.11	0.45	2.34	5.42	27.19	74.48	57.10	17.38
1972	1.11	0.00	2.00	7.36	4.25	0.00	0.00	0.00	4.37	18.10	14.85	11.60	63.64	47.66	15.98
1973	0.00	3.78	0.04	1.19	0.00	0.00	0.00	0.00	1.35	7.15	12.58	28.45	54.54	52.00	2.54
1974	0.00	3.99	0.00	5.08	0.20	0.00	0.00	1.35	5.20	1.22	0.74	14.36	32.14	20.31	11.83
1975	4.70	3.02	7.16	3.40	1.80	0.25	3.98	0.00	0.05	0.00	10.85	11.56	46.77	37.29	9.48
1976	5.79	1.88	0.41	4.41	0.00	0.00	0.31	0.43	0.00	5.94	12.49	13.39	45.05	39.90	5.15
1977	4.97	0.44	1.40	0.81	1.66	0.00	1.45	1.10	2.58	10.51	12.59	12.12	49.63	42.03	7.60
MEAN	9.46	5.81	3.47	6.38	1.73	0.16	0.74	1.33	1.49	7.28	11.59	16.35	65.80	53.95	11.84

Table B.1.5 MONTHLY RAINFALL AT POLONNARUWA

* MONTHLY RAINFALL AT POLONNARUWA
* UNIT : INCH

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL	MAHA OCT-MAR	YALA APR-SEP
1950	5.29	2.02	6.65	0.55	2.43	0.00	0.00	3.24	0.71	4.63	6.76	7.03	39.31	32.38	6.93
1951	19.70	4.28	2.97	5.31	0.54	0.00	2.18	1.63	5.82	2.45	15.12	10.44	70.44	54.96	15.48
1952	18.26	5.02	1.83	5.25	3.82	0.00	2.08	0.00	4.15	7.05	7.31	8.94	63.71	48.41	15.30
1953	8.82	3.52	2.88	8.45	0.00	2.91	6.75	1.42	5.24	10.46	9.64	17.20	77.29	52.52	24.77
1954	11.69	3.84	8.33	4.43	0.00	0.00	3.58	2.55	0.00	7.86	7.26	22.76	72.30	61.74	10.56
1955	10.27	4.16	1.22	5.03	1.75	0.00	0.00	5.28	6.86	6.48	4.04	5.80	50.89	31.97	18.92
1956	4.94	2.51	2.35	4.13	0.02	4.37	0.48	2.17	0.17	8.82	12.28	11.84	54.08	42.74	11.34
1957	4.44	12.42	0.00	2.80	5.01	0.09	3.22	0.71	0.58	7.02	24.12	47.98	108.39	95.98	12.41
1958	7.56	3.59	4.08	3.20	2.37	0.00	0.00	6.29	1.23	8.35	8.93	15.65	61.25	48.16	13.09
1959	10.55	0.60	0.56	3.80	1.15	0.85	0.00	1.18	0.68	14.62	13.33	10.16	57.48	49.82	7.66
1960	10.82	16.11	3.34	12.07	6.47	0.00	5.52	0.94	1.48	3.98	10.42	5.08	76.23	49.75	26.48
1961	16.65	10.23	4.08	4.55	5.54	0.27	0.00	0.00	0.36	5.69	13.73	20.21	81.31	70.59	10.72
1962	8.17	2.58	2.83	3.77	3.00	0.00	0.19	1.07	5.00	6.65	8.09	8.75	50.10	37.07	13.03
1963	19.24	10.13	4.00	8.54	1.55	0.07	1.88	0.20	5.28	7.41	19.31	17.01	94.62	77.10	17.52
1964	6.40	8.69	10.06	3.12	1.51	0.00	4.08	1.83	2.87	3.43	5.79	6.11	53.89	40.48	13.41
1965	4.15	16.23	0.90	7.16	6.25	0.85	0.00	5.98	0.02	9.50	23.47	22.60	97.11	76.85	20.26
1966	9.52	0.69	6.36	9.44	0.10	0.10	0.21	4.71	2.05	16.61	20.25	10.07	80.11	63.50	16.61
1967	2.58	4.85	2.08	3.45	0.43	0.00	0.00	0.03	0.59	10.23	18.37	19.90	62.51	58.01	4.50
1968	5.28	0.00	4.80	3.88	0.05	0.00	0.00	0.16	1.28	7.46	12.36	8.39	43.66	38.29	5.37
1969	4.37	1.66	1.11	10.67	0.00	0.00	3.80	3.44	1.35	10.62	4.30	27.93	69.25	49.99	19.26
1970	7.08	11.92	0.74	7.75	5.42	3.75	0.00	4.07	1.40	8.65	19.24	12.87	82.89	60.50	22.39
1971	6.94	4.00	6.32	6.62	1.19	0.00	5.86	11.13	0.10	7.88	7.09	31.42	88.55	63.65	24.90
1972	1.58	0.00	0.00	5.44	5.21	0.00	0.46	0.02	16.03	24.31	22.81	17.14	93.00	65.84	27.16
1973	0.80	4.60	1.75	1.45	3.50	2.60	13.70	1.76	15.05	7.24	15.41	49.47	117.33	79.27	38.06
1974	0.00	2.18	1.30	5.70	2.58	0.00	0.00	0.03	5.95	1.00	7.54	9.32	35.60	21.34	14.26
1975	5.83	6.85	8.03	7.54	4.44	0.00	20.00	3.81	0.00	8.27	11.24	15.04	91.05	55.26	35.79
1976	9.06	0.60	0.15	2.32	0.00	1.76	0.68	3.10	4.15	4.97	23.88	27.00	77.67	65.66	12.01
1977	6.06	1.95	5.71	7.51	4.78	0.19	6.53	3.29	6.09	10.29	26.38	20.31	99.09	70.70	28.39
MEAN	8.07	5.19	3.37	5.50	2.47	0.64	2.90	2.50	3.37	8.28	13.52	17.37	73.18	55.80	17.38

Table B.1.6 MONTHLY RAINFALL AT HINGURAKGODA

* MONTHLY RAINFALL AT HINGURAKGODA
* UNIT : INCH

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL	MAHA OCT-MAR	YALA APR-SEP
1950	5.20	3.70	6.48	0.74	5.02	0.00	0.22	3.86	1.05	3.64	7.76	6.56	45.03	33.34	11.69
1951	22.04	4.17	1.48	5.68	5.99	0.23	0.32	1.25	3.72	3.46	19.45	7.19	74.98	57.79	17.19
1952	15.89	2.19	1.05	4.38	3.62	0.02	1.21	0.00	5.48	5.28	6.48	7.13	52.73	38.02	14.71
1953	9.58	1.88	0.61	10.19	0.07	0.06	9.19	2.77	2.76	12.17	7.60	18.31	75.19	50.15	25.04
1954	10.74	1.35	6.79	7.14	0.05	0.00	3.46	1.34	0.00	7.28	6.48	16.39	61.02	49.03	11.99
1955	10.52	4.90	2.08	7.49	1.93	0.00	0.04	3.62	4.04	2.66	6.23	6.97	50.48	33.36	17.12
1956	6.40	1.81	0.72	3.01	0.05	2.81	0.03	1.09	0.03	9.38	11.27	10.49	47.09	40.07	7.02
1957	4.27	10.05	0.00	2.05	4.43	0.16	2.72	1.45	1.92	7.56	23.90	52.81	111.32	98.59	12.73
1958	9.27	4.47	4.49	2.52	2.69	0.03	0.43	6.18	1.95	4.83	8.42	8.29	53.57	39.77	13.80
1959	6.88	0.44	0.26	4.47	4.48	2.07	0.13	0.52	1.97	11.32	13.73	10.51	56.78	43.14	13.64
1960	11.07	16.63	2.35	8.13	8.94	0.10	6.35	1.16	5.80	7.18	19.12	4.10	90.93	60.45	30.48
1961	17.87	8.54	6.14	4.92	2.41	0.41	0.27	0.05	1.21	9.99	12.08	19.81	83.70	74.43	9.27
1962	7.75	2.91	3.59	4.04	2.04	0.00	0.00	3.66	5.12	5.49	8.66	8.27	51.53	36.67	14.86
1963	17.93	7.68	7.24	4.76	0.64	0.00	3.39	0.83	5.55	4.77	23.11	19.72	95.62	80.45	15.17
1964	5.55	5.28	4.91	1.33	4.49	0.00	4.06	0.62	2.23	7.01	4.67	5.26	45.41	32.68	12.73
1965	3.67	7.10	0.62	8.50	8.86	0.00	0.39	4.77	0.00	16.22	15.76	21.50	87.39	64.87	22.52
1966	6.81	0.98	6.07	5.43	0.08	0.02	0.15	2.13	6.18	20.93	16.20	8.46	73.44	59.45	13.99
1967	1.35	3.64	3.50	2.69	1.73	0.19	0.06	0.40	2.91	13.59	19.21	22.71	71.98	64.00	7.98
1968	5.84	0.00	5.49	2.45	0.46	0.00	0.00	3.36	5.29	7.35	9.03	8.38	47.65	36.09	11.56
1969	3.33	2.49	0.11	6.25	0.64	0.00	4.07	2.37	6.32	12.96	11.06	33.55	83.15	63.50	19.65
1970	4.82	8.87	2.12	7.39	3.30	1.65	0.02	4.55	1.90	2.36	11.23	13.06	61.27	42.46	18.81
1971	8.79	3.68	1.82	8.89	4.71	0.47	1.43	2.34	1.00	3.50	5.22	25.33	67.18	48.34	18.84
1972	2.93	0.07	0.67	4.94	5.41	0.00	0.00	0.01	14.53	12.27	14.69	12.15	67.67	42.78	24.89
1973	0.00	2.28	2.00	1.56	2.12	2.99	8.93	0.50	3.72	5.52	3.71	18.74	52.07	32.25	19.82
1974	0.00	2.25	0.38	4.05	6.56	0.00	0.00	0.13	3.35	0.24	4.55	16.66	38.17	24.08	14.09
1975	5.60	2.26	2.60	6.80	5.22	0.00	8.38	2.74	5.50	1.91	9.45	7.13	57.59	28.95	28.64
1976	1.27	0.85	0.18	6.31	0.62	0.00	1.43	1.90	1.15	3.48	12.56	19.53	49.28	37.87	11.41
1977	3.31	1.44	2.23	0.84	1.29	0.00	1.93	1.55	8.60	14.03	14.74	14.76	64.72	50.51	14.21
MEAN	7.45	4.00	2.71	4.89	3.14	0.40	2.09	1.97	3.72	7.73	11.66	15.13	64.89	48.68	16.21

Table B.1.7 MONTHLY RAINFALL AT KANTALAI

* MONTHLY RAINFALL AT KANTALAI
* UNIT : INCH

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL	MAHA OCT-MAR	YALA APR-SEP
1950	2.75	3.18	1.45	0.60	6.85	0.00	0.00	4.26	2.57	5.10	10.57	10.71	48.07	33.79	14.28
1951	18.75	4.20	2.24	5.90	2.65	0.00	1.80	1.13	5.68	3.65	13.48	9.42	68.93	51.77	17.16
1952	16.01	1.30	0.05	5.72	2.77	0.00	1.64	0.00	2.66	1.14	9.25	6.68	47.82	35.03	12.79
1953	9.93	2.46	3.66	12.10	0.00	0.41	11.49	0.90	1.28	6.30	7.04	12.08	67.70	41.52	26.18
1954	12.6	2.10	4.17	4.96	0.61	0.00	2.30	3.76	2.04	7.45	5.95	24.95	70.98	57.31	13.67
1955	13.75	5.41	1.13	11.92	5.95	0.00	0.50	13.91	6.06	4.83	3.02	8.77	75.25	36.91	38.34
1956	5.65	1.97	0.15	4.01	0.12	2.79	2.66	2.77	4.43	10.45	15.39	8.00	58.62	41.84	16.78
1957	4.70	5.24	0.05	0.31	2.62	0.08	2.54	0.88	3.44	10.96	20.15	37.98	88.95	79.08	9.87
1958	3.96	2.75	5.16	4.25	0.46	0.00	1.64	6.67	3.06	6.34	5.56	8.03	47.88	31.80	16.08
1959	6.50	0.65	0.22	3.83	0.42	5.42	0.00	5.40	1.89	7.65	12.93	12.49	57.40	40.44	16.96
1960	9.13	11.24	1.02	7.32	2.21	0.00	7.28	0.00	2.44	5.00	17.92	4.52	68.08	48.83	19.25
1961	16.19	4.73	3.65	2.15	1.59	0.16	0.59	0.08	4.16	11.40	17.39	22.53	84.62	75.89	8.73
1962	10.04	2.19	1.18	4.10	3.99	0.00	0.70	1.38	3.17	5.20	7.94	12.67	52.56	39.22	13.34
1963	14.43	6.42	3.77	5.93	3.48	0.00	2.14	0.99	3.86	5.81	26.21	19.72	92.76	76.36	16.40
1964	4.44	1.27	5.92	1.86	0.40	0.00	5.17	4.84	0.35	8.80	5.24	6.09	44.38	31.76	12.62
1965	2.81	9.69	0.93	7.11	4.73	0.24	0.00	11.88	1.94	10.83	15.83	27.94	93.93	68.03	25.90
1966	9.81	1.86	3.17	5.55	0.00	0.00	0.28	8.35	4.42	16.24	16.41	9.21	75.30	56.70	18.60
1967	1.18	4.40	1.63	3.28	1.08	0.00	0.00	4.61	2.20	13.55	19.21	18.45	69.59	58.42	11.17
1968	5.84	0.11	5.49	4.32	1.00	0.10	0.00	3.36	5.29	4.53	15.03	14.35	59.42	45.35	14.07
1969	4.80	4.94	0.00	4.87	0.85	0.00	4.03	7.05	1.57	11.31	9.87	20.37	69.66	51.29	18.37
1970	6.80	6.77	2.19	5.31	3.80	0.41	0.03	2.64	3.74	4.19	14.05	9.12	59.05	43.12	15.93
1971	6.81	0.53	1.45	1.97	1.85	0.03	2.54	4.39	4.81	4.24	7.16	25.08	60.86	45.27	15.59
1972	1.21	1.49	0.78	1.75	2.46	1.68	1.63	0.00	8.49	12.15	9.85	11.08	52.57	36.56	16.01
1973	0.75	1.33	0.28	0.24	2.11	8.23	3.05	1.55	5.44	10.98	2.59	20.34	56.89	36.27	20.62
1974	0.00	1.91	0.08	4.65	4.65	0.00	2.80	1.44	4.11	0.95	4.50	14.12	39.21	21.56	17.65
1975	2.26	1.10	1.99	1.06	3.51	0.00	3.74	3.67	1.85	3.25	9.32	7.42	39.17	25.34	13.83
1976	0.85	0.12	0.07	2.53	0.00	1.50	3.12	3.03	3.53	5.26	10.61	15.61	46.23	32.52	13.71
1977	1.77	5.26	2.67	1.83	1.84	0.09	1.03	1.55	8.60	14.35	12.90	12.15	64.04	49.10	14.94
MEAN	6.96	3.38	1.95	4.27	2.21	0.76	2.24	3.59	3.68	7.57	11.62	14.64	62.85	46.11	16.74

Table B.1.8 AVERAGE MONTHLY RAINFALL (IN MILLIMETER) (1950 - 1977)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Elahera	240	148	88	162	44	4	19	34	38	185	294	415	1,671
Polonnauruwa	205	132	86	140	63	16	74	64	86	210	343	441	1,859
Hingurakgoda	189	102	69	124	80	10	53	50	94	196	296	384	1,648
Kantalai	177	86	50	108	56	19	57	91	93	192	295	372	1,597

Table B.1.9 MONTHLY MEAN PAN-EVAPORATION AT METEOROLOGICAL STATIONS

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
°Anuralhapura	118	134	189	174	198	207	220	220	207	143	108	102	2,020
Badulla	93	101	143	129	143	138	158	164	159	127	90	78	1,523
Batticaloa	133	143	164	183	205	207	220	214	198	164	138	118	2,087
Colombo	143	134	180	159	143	144	143	143	138	133	129	133	1,722
Diyatalawa	102	115	133	114	133	138	158	164	144	112	84	87	1,484
Galle	143	148	180	174	174	168	174	180	183	164	138	143	1,969
Hambantota	189	193	205	183	180	192	205	205	192	174	153	158	2,229
Jaffna	158	162	214	213	245	222	214	198	213	158	129	112	2,238
Kankesanturai	164	171	198	207	229	228	214	198	207	158	129	133	2,236
Katugastota	174	185	205	174	174	159	164	174	159	143	129	143	1,983
Kurunegaia	174	185	214	192	198	168	189	198	183	158	138	143	2,140
°Maha Illuppallama	127	157	205	174	205	213	229	220	222	164	123	118	2,157
Mannar	158	157	220	198	214	198	189	198	192	149	129	133	2,135
Nuwara Eliya	118	129	174	138	112	114	102	102	108	93	90	102	1,382
Puttalam	164	162	205	168	198	198	189	214	207	149	123	127	2,104
Ratnapura	143	162	164	144	133	123	133	143	129	127	114	127	1,642
°Trincomale	164	162	198	207	251	258	282	260	243	174	138	133	2,470
Vavuniya	133	134	180	174	190	213	220	220	207	143	123	102	2,039

Table B.1.10 PAN-EVAPORATION AND ESTIMATED EVAPORATION FROM TANK SURFACE

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
KALAWEWA	122	131	153	153	171	181	190	194	198	151	126	120	1,901
KANTALAI	105	106	136	128	162	190	193	183	173	146	102	92	1,716
BATALAGODA	116	129	146	125	118	115	117	130	133	119	98	109	1,455
TOPPAWEWA	108	116	138	143	189	212	235	209	202	152	122	105	1,931
Estimated Value from Tank Surface	92	98	125	115	128	136	143	145	149	113	95	90	1,428

Table B.1.11 AVERAGE MONTHLY METEOROLOGICAL DATA AT MAHA-ILLUPPALLAMA

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
KALAWEWA	122	131	153	153	171	181	190	194	198	151	126	120	1,901
KANTALAI	105	106	136	128	162	190	193	183	173	146	102	92	1,716
BATALAGODA	116	129	146	125	118	115	117	130	133	119	98	109	1,455
TOPPAWEWA	108	116	138	143	189	212	235	209	202	152	122	105	1,931
Estimated Value from Tank Surface	92	98	125	115	128	136	143	145	149	113	95	90	1,428

Table B.2.1 MONTHLY RUNOFF AT POLGOLLA OF MAHAWELI GANGA

* MONTHLY RUNOFF IN MILLION CUBIC METERS
* MAHAWELI GANGA AT POLGOLLA (CATCHMENT AREA : 1292 SQ.KM.)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	mean
1950	66	57	75	49	154	136	246	232	508	227	133	64	1947	162
1951	264	101	71	117	69	928	299	24	322	328	441	132	2536	245
1952	200	83	53	349	773	468	234	259	108	564	168	88	3147	262
1953	61	44	47	88	44	83	325	184	174	219	152	115	1536	128
1954	103	64	90	168	218	197	206	374	213	458	181	328	2600	217
1955	187	124	107	161	411	702	325	183	214	228	228	126	2996	250
1956	72	58	73	64	113	627	213	240	228	372	423	183	2671	222
1957	115	95	64	77	117	444	508	202	144	175	388	1027	3356	279
1958	237	78	167	129	229	249	235	278	121	372	326	136	2557	213
1959	91	72	67	121	137	614	516	204	206	334	250	156	2770	231
1960	122	178	85	149	173	258	306	264	477	372	443	153	2980	248
1961	84	64	56	73	279	188	227	385	198	207	243	195	2199	183
1962	108	53	46	66	280	164	255	189	306	383	240	143	2253	188
1963	137	71	64	115	117	178	255	217	210	340	246	296	2246	187
1964	143	84	71	56	96	113	264	254	266	178	380	124	2029	169
1965	53	49	36	139	442	283	115	257	156	290	239	202	2261	188
1966	90	40	56	110	60	67	108	121	355	314	253	122	1696	141
1967	91	75	73	57	56	148	193	174	93	431	320	350	2061	172
1968	85	41	65	78	146	251	515	344	319	308	300	183	2635	220
1969	102	56	42	146	280	372	188	131	237	291	183	218	2254	188
1970	156	129	65	143	146	238	204	379	174	310	321	342	2607	217
1971	178	76	69	177	192	303	346	359	553	381	195	270	3099	258
1972	76	41	29	82	367	108	329	237	173	481	403	293	2619	218
1973	100	46	34	55	36	102	144	324	108	112	200	223	1484	124
1974	107	58	77	149	232	352	539	436	383	306	132	133	2904	242
1975	102	47	53	98	135	502	175	441	356	400	671	226	3208	267
1976	121	46	9	96	40	34	153	118	95	228	234	158	1332	111
1977	46	31	36	76	222	275	210	153	91	371	242	116	1869	156
TOTAL	3237	1961	1780	3008	5572	8304	7635	6963	6688	8980	7940	6106	68254	5688
MEAN	116	70	64	107	199	299	273	249	239	321	284	218	2438	203

Table B.2.2 AVERAGE MONTHLY NATURAL RUNOFF AND DIVERSION WATER
(1950 - 1977 RECORDS)

Unit: MCM

Month	Average Monthly Natural Runoff			Diversion Water				Inflow to Moragahakanda	
				Polgolla					
	Polgolla	Elahera	Angamedilla	Before Kotmale	After Kotmale	Nalanda	Bowatenna	Before Kotmale	After Kotmale
Jan.	116	142	272	89	114	3.3	23	207	229
Feb.	70	88	162	56	89	1.3	37	119	142
Mar.	64	49	97	49	90	0.7	41	76	101
Apr.	107	46	89	81	119	0.8	42	85	118
May	199	43	75	100	131	3.3	54	90	120
June	299	26	43	119	137	3.4	70	77	92
July	273	24	48	135	145	3.7	66	86	96
Aug.	249	21	34	131	146	3.1	57	93	106
Sep.	239	20	37	123	137	1.8	71	71	83
Oct.	321	54	89	141	146	2.5	15	172	182
Nov.	284	98	172	138	144	1.3	25	209	214
Dec.	218	167	332	121	139	1.4	18	268	287
Total	2,439	778	1,450	1,283	1,537	26.6	519	1,553	1,770

Table B.2.3 RUNOFF RECORD AT ELAHERA

* AMBAN GANGA AT ELAHERA
* NATURAL RUNOFF IN MILLION CUBIC METERS
* CATCHMENT AREA : 779 SQ.KM.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	MEAN
1950	144	40	87	46	28	24	25	22	40	36	38	52	562	47
1951	330	101	60	55	28	66	30	13	58	59	125	162	1025	85
1952	265	306	66	53	41	35	16	14	11	79	81	83	852	71
1953	61	34	32	52	9	3	14	9	5	62	60	103	446	37
1954	173	97	61	58	20	12	12	9	5	54	46	260	805	67
1955	214	119	68	62	60	37	17	11	30	26	30	40	694	58
1956	32	54	51	49	30	15	5	3	2	10	99	102	452	38
1957	79	90	36	9	22	32	17	7	4	66	119	398	879	73
1958	114	69	104	88	92	24	18	32	8	51	77	107	764	64
1959	80	28	9	27	37	26	45	31	19	57	92	155	613	51
1960	144	302	73	58	34	23	45	17	17	46	143	99	1001	83
1961	117	65	51	30	43	25	24	26	12	18	99	155	660	55
1962	143	92	32	52	65	23	21	21	26	91	90	147	825	69
1963	257	151	61	69	44	22	19	20	14	35	95	223	1008	84
1964	256	143	80	38	32	18	29	19	20	25	64	130	852	71
1965	79	112	38	71	29	31	17	32	15	52	105	185	816	68
1966	134	74	66	46	22	14	11	9	25	60	147	103	711	59
1967	120	118	56	40	31	24	20	18	10	58	189	246	930	78
1968	128	43	70	34	17	15	31	17	12	52	125	176	720	60
1969	134	94	34	60	31	22	13	29	24	93	63	179	778	65
1970	214	246	65	75	46	22	19	16	20	44	72	161	998	83
1971	210	85	50	68	89	42	26	50	68	60	61	311	1080	90
1972	97	49	18	27	80	19	24	14	12	88	108	227	763	64
1973	61	47	19	19	16	11	10	9	8	9	45	177	431	36
1974	61	19	20	33	21	18	26	33	44	27	21	94	417	35
1975	78	38	45	22	25	25	23	30	29	23	145	116	599	50
1976	185	54	42	30	21	1	15	17	22	84	170	192	793	66
1977	85	22	28	39	142	117	94	47	27	140	232	291	1262	105
TOTAL	3977	2454	1342	1284	1207	726	644	577	567	1503	2741	4674	21736	1812
MEAN	142	88	49	46	43	26	24	21	20	54	98	167	776	65

Table B.2.4 RUNOFF RECORD AT ANGAMEDILLA

* AMBAN GANGA AT ANGAMADILLA
* NATURAL RUNOFF IN MILLION CUBIC METERS
* CATCHMENT AREA : 1458 SQ.KM.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	MEAN
1950	271	73	145	49	53	48	48	41	74	50	53	74	999	83
1951	448	180	76	98	45	70	43	24	173	85	200	331	1793	149
1952	371	208	83	110	106	53	24	20	16	113	119	140	1383	115
1953	141	60	69	80	15	4	24	19	9	116	113	196	865	72
1954	328	183	116	108	38	24	24	18	9	81	74	473	1472	123
1955	414	218	101	114	95	58	25	14	41	49	59	74	1262	105
1956	89	84	80	71	65	26	9	4	5	20	191	196	822	69
1957	166	169	68	18	60	60	30	10	8	121	226	748	1642	137
1958	218	91	196	148	170	64	31	60	18	95	143	200	1434	120
1959	168	51	168	51	69	69	80	59	33	108	170	291	1297	108
1960	304	421	111	93	59	46	66	28	29	66	210	176	1599	133
1961	241	134	95	68	75	39	34	36	18	29	196	325	1290	108
1962	345	203	65	101	109	39	33	33	38	130	158	291	1545	129
1963	520	289	115	124	76	34	26	28	21	49	164	424	1870	156
1964	511	278	141	69	55	26	43	29	26	35	89	220	1522	127
1965	150	265	66	119	128	46	24	45	21	79	171	339	1453	121
1966	266	151	140	88	60	21	18	14	36	96	250	183	1299	108
1967	260	241	108	68	50	34	280	25	15	89	351	460	1981	165
1968	108	79	124	69	30	23	68	24	19	75	193	355	1347	112
1969	276	184	65	101	55	34	18	64	34	135	96	359	1399	117
1970	401	453	111	124	78	34	28	28	31	71	123	334	1810	151
1971	390	120	96	114	114	64	40	66	103	89	115	715	2026	169
1972	208	91	64	201	129	26	41	24	28	181	200	464	1657	138
1973	108	64	33	38	30	21	20	20	11	20	86	333	784	65
1974	113	53	38	63	39	31	49	63	80	51	39	176	775	65
1975	148	73	86	41	48	49	44	58	58	46	271	219	1139	95
1976	309	100	28	58	19	1	28	31	41	120	318	359	1482	124
1977	118	41	53	73	265	219	176	89	51	300	434	544	2363	197
TOTAL	7408	4537	2710	2479	2093	1211	1350	954	1466	2695	4812	9019	40319	3361
MEAN	272	172	97	89	75	43	48	34	37	89	172	322	1440	120

Table B.2.5 RUNOFF RECORD AT MINNERIYA

* MINNERIYA TANK
* NATURAL INFLOW IN MILLION CUBIC METERS
* CATCHMENT AREA : 1284 SQ.KM.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	MEAN
1950	8	6	10	7	8	0	0	6	3	6	13	10	72	6
1951	34	4	2	8	10	0	0	2	5	5	29	11	112	9
1952	24	3	2	6	5	0	2	0	8	8	10	11	79	7
1953	14	3	2	16	0	0	14	5	5	18	11	27	115	10
1954	16	2	10	11	0	0	5	2	0	11	10	24	91	8
1955	14	8	3	11	3	0	0	5	6	5	10	11	78	7
1956	10	3	2	5	0	5	0	2	0	14	18	16	75	6
1957	8	16	8	3	8	0	5	2	3	11	35	80	167	14
1958	14	6	8	3	5	0	0	10	3	8	13	13	81	7
1959	10	0	0	6	6	3	0	0	3	18	21	16	83	7
1960	16	26	3	13	13	0	10	2	8	11	29	6	137	11
1961	27	13	10	8	3	0	0	0	2	14	18	30	125	10
1962	5	5	5	8	3	0	0	5	8	8	13	13	71	6
1963	27	11	11	8	2	0	5	2	8	8	35	30	147	12
1964	8	8	8	2	6	0	6	2	3	11	6	8	68	6
1965	5	11	2	13	13	0	0	8	0	24	24	32	132	11
1966	10	2	10	8	0	0	0	3	10	32	24	13	112	9
1967	2	5	5	5	3	0	0	0	5	21	29	34	109	9
1968	8	0	8	3	0	0	0	5	8	11	13	13	69	6
1969	5	3	0	10	2	0	6	3	10	19	16	51	125	10
1970	8	13	3	11	5	3	0	6	3	3	18	19	92	8
1971	13	5	3	13	6	0	2	3	2	5	8	38	98	8
1972	5	0	2	8	8	0	0	0	22	19	22	18	104	9
1973	0	3	3	3	3	5	13	0	5	8	5	29	77	6
1974	0	3	0	6	10	0	0	0	5	0	6	26	56	5
1975	8	3	3	10	8	0	13	5	8	3	14	11	86	7
1976	2	2	0	10	2	0	2	3	2	5	19	29	76	6
1977	5	2	3	0	2	0	3	3	13	21	22	22	96	8
TOTAL	306	168	116	208	132	16	86	84	158	327	491	641	2733	228
MEAN	11	6	4	7	5	1	3	3	6	12	18	23	98	8

Table B.2.6 RUNOFF RECORD AT KAUDULLA

* KAUDULLA TANK
* NATURAL INFLOW IN MILLION CUBIC METERS
* CATCHMENT AREA : 485 SQ.KM.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	MEAN
1950	2	1	2	0	2	0	0	1	1	1	3	2	15	1
1951	2	1	0	2	2	0	0	0	1	1	6	2	22	2
1952	5	1	0	1	1	0	0	0	2	2	2	2	16	1
1953	3	1	0	3	0	0	3	1	1	4	3	6	25	2
1954	4	0	2	2	0	0	1	0	0	2	2	5	18	2
1955	3	2	1	2	1	0	0	1	1	1	2	2	16	1
1956	2	1	0	1	0	1	0	0	0	3	4	3	15	1
1957	1	3	0	1	1	0	1	0	1	3	8	17	36	3
1958	3	1	1	1	1	0	0	2	1	2	3	3	18	2
1959	2	0	0	1	1	1	0	0	1	4	5	3	18	2
1960	3	5	1	5	3	0	2	0	2	2	6	1	28	2
1961	6	3	2	2	1	0	0	0	0	3	4	7	28	2
1962	1	1	1	1	1	0	0	1	2	2	3	3	16	1
1963	6	3	2	2	0	0	1	0	2	2	8	2	33	3
1964	2	2	2	0	1	0	1	0	1	2	2	2	15	1
1965	1	2	0	3	3	0	0	2	0	5	5	7	28	2
1966	2	0	2	2	0	0	0	1	2	7	5	3	24	2
1967	0	1	1	1	1	0	0	0	1	4	6	8	23	2
1968	2	0	2	1	0	0	0	1	2	2	3	3	16	1
1969	1	1	0	2	0	0	1	1	2	4	4	11	27	2
1970	2	3	1	2	1	1	0	2	1	1	4	4	22	2
1971	3	1	1	3	2	0	0	1	0	1	2	8	22	2
1972	1	0	0	2	2	0	0	0	5	4	5	4	23	2
1973	0	1	1	1	1	1	3	0	1	2	1	6	18	2
1974	0	1	0	1	2	0	0	0	1	0	2	6	13	1
1975	2	1	1	2	2	0	3	1	2	1	3	2	20	2
1976	0	0	0	2	0	0	0	1	0	1	4	6	14	1
1977	1	0	1	0	0	0	1	1	3	5	5	5	22	2
TOTAL	65	36	24	44	29	4	17	17	36	71	110	138	591	49
MEAN	2	1	1	2	1	0	1	1	1	3	4	5	21	2

Table B.2.7 RUNOFF RECORD AT KANTALAI

* KANTALAI TANK
* NATURAL INFLOW IN MILLION CUBIC METERS
* CATCHMENT AREA : 487 SQ.KM.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	MEAN
1950	12	10	15	2	12	0	0	10	5	10	22	17	115	10
1951	56	10	5	15	15	0	0	2	10	10	51	20	194	16
1952	42	5	2	12	10	0	2	0	15	15	17	20	140	12
1953	25	5	2	27	0	0	25	7	7	32	20	49	199	17
1954	27	5	17	20	0	0	10	2	0	20	17	44	162	14
1955	27	12	5	20	5	0	0	10	10	7	17	17	130	11
1956	17	5	2	7	0	7	0	2	0	25	29	27	121	10
1957	12	27	0	5	12	0	7	5	5	20	61	137	291	24
1958	25	12	12	7	7	0	0	17	5	12	22	22	141	12
1959	17	0	0	12	12	5	0	2	5	29	37	27	146	12
1960	27	44	7	22	22	0	17	2	15	20	49	10	235	20
1961	47	22	17	12	7	0	0	0	2	27	32	51	217	18
1962	7	7	10	10	5	0	0	10	12	15	22	22	120	10
1963	47	20	20	12	2	0	10	2	15	12	61	51	252	21
1964	15	15	12	2	12	0	10	2	5	17	12	15	117	10
1965	10	20	2	22	22	0	0	12	0	42	42	56	228	19
1966	17	2	17	15	0	0	0	5	17	54	42	22	191	16
1967	2	10	10	7	5	0	0	0	7	34	49	59	183	15
1968	15	0	15	7	2	0	0	10	15	20	25	22	131	11
1969	10	7	0	17	2	0	10	7	17	34	29	88	221	18
1970	12	22	5	20	10	5	0	12	5	7	29	34	161	13
1971	22	10	5	22	12	2	5	5	2	10	15	66	176	15
1972	7	0	2	12	15	0	0	0	37	32	39	32	176	15
1973	0	5	5	5	5	7	22	2	10	15	10	49	135	11
1974	0	5	0	10	17	0	0	0	10	0	12	44	98	8
1975	15	5	7	17	15	0	22	7	12	5	25	20	150	13
1976	2	2	0	17	2	0	5	5	2	10	32	51	128	11
1977	10	5	5	2	2	0	5	5	22	37	39	39	171	14
TOTAL	525	292	199	358	230	26	150	143	267	571	857	1111	4729	396
MEAN	19	10	7	13	8	1	5	5	10	20	31	40	169	14

Table B.2.8 RUNOFF RECORD AT GIRITALE

* GIRITALE TANK
* NATURAL INFLOW IN MILLION CUBIC METERS
* CATCHMENT AREA : 24 SQ.KM.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	MEAN
1950	1	0	1	0	1	0	0	0	0	0	1	1	5	0
1951	2	0	0	1	1	0	0	0	0	0	2	1	7	1
1952	2	0	0	0	0	0	0	0	1	1	1	1	6	1
1953	1	0	0	1	0	0	1	0	0	1	1	2	7	1
1954	1	0	1	1	0	0	0	0	0	1	1	2	7	1
1955	1	1	0	1	0	0	0	0	0	0	1	1	5	0
1956	1	0	0	0	0	0	0	0	0	1	1	1	4	0
1957	0	1	0	0	0	0	0	0	0	1	2	5	9	1
1958	1	0	0	0	0	0	0	1	0	1	1	1	5	0
1959	1	0	0	0	0	0	0	0	0	1	1	1	4	0
1960	1	2	0	1	1	0	1	0	1	1	2	0	10	1
1961	2	1	1	1	0	0	0	0	0	1	1	2	9	1
1962	0	0	0	0	0	0	0	0	1	1	1	1	4	0
1963	2	1	1	1	0	0	0	0	1	1	2	2	11	1
1964	1	1	1	0	0	0	0	0	0	1	0	1	5	0
1965	0	1	0	1	1	0	0	1	0	2	2	2	10	1
1966	1	0	1	1	0	0	0	0	1	2	2	1	9	1
1967	0	0	0	0	0	0	0	0	0	1	2	2	5	0
1968	1	0	1	0	0	0	0	0	1	1	1	1	6	1
1969	0	0	0	1	0	0	0	0	1	1	1	3	7	1
1970	1	1	0	1	0	0	0	0	0	0	1	1	5	0
1971	1	0	0	1	0	0	0	0	0	0	1	2	5	0
1972	0	0	0	1	1	0	0	0	1	1	1	1	6	1
1973	0	0	0	0	0	0	1	0	0	1	0	2	4	0
1974	0	0	0	0	1	0	0	0	0	0	0	2	3	0
1975	1	0	0	1	1	0	1	0	1	0	1	1	7	1
1976	0	0	0	1	0	0	0	0	0	0	1	2	4	0
1977	0	0	0	0	0	0	0	0	1	1	1	1	4	0
TOTAL	22	9	7	15	7	0	4	2	10	22	32	43	173	14
MEAN	1	0	0	1	0	0	0	0	0	1	1	2	6	1

Table B.2.9 RUNOFF RECORD AT PARAKRAMA SAMUDRA

* PARAKRAMA SAMUDRA TANK
* NATURAL RUNOFF IN MILLION CUBIC METERS
* CATCHMENT AREA : 73 SQ.KM.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	MEAN
1950	2	1	2	0	1	0	0	1	0	2	2	2	13	1
1951	2	2	1	2	0	0	1	1	2	1	5	4	21	2
1952	2	2	1	2	1	0	1	0	1	3	3	3	24	2
1953	3	1	1	3	0	1	2	1	2	4	3	6	27	2
1954	4	1	3	2	0	0	1	1	0	3	3	8	26	2
1955	4	1	0	2	1	0	0	2	2	2	1	2	17	1
1956	2	1	1	1	0	2	0	1	0	3	4	4	19	2
1957	2	4	0	1	2	0	1	0	0	2	9	17	38	3
1958	3	1	1	1	1	0	0	2	0	3	3	6	21	2
1959	4	0	0	1	0	0	0	0	0	5	5	4	19	2
1960	4	6	1	4	2	0	2	0	1	1	4	2	27	2
1961	4	4	1	2	2	0	0	0	0	2	5	7	29	2
1962	3	1	1	1	1	0	0	0	2	2	3	3	17	1
1963	7	4	1	3	1	0	1	0	2	3	7	6	35	3
1964	2	3	4	1	0	0	1	1	1	1	2	2	18	2
1965	1	6	0	3	2	0	0	2	0	3	8	8	33	3
1966	3	0	2	3	0	0	0	2	1	6	1	4	22	2
1967	1	5	2	1	0	0	0	0	0	4	7	7	27	2
1968	2	0	2	1	0	0	0	0	0	3	4	3	15	1
1969	2	1	4	4	0	0	1	1	1	4	2	10	30	3
1970	3	4	0	3	2	1	0	1	1	3	2	5	30	3
1971	2	1	2	2	0	0	2	4	0	3	3	11	30	3
1972	6	0	0	2	2	0	0	0	6	9	8	1	34	3
1973	0	2	1	1	1	1	5	1	5	3	5	18	43	4
1974	0	1	0	2	1	0	0	0	2	0	3	3	12	1
1975	2	2	3	3	2	0	1	1	0	3	4	5	26	2
1976	3	0	0	1	0	1	0	1	1	2	8	10	27	2
1977	2	1	2	3	2	0	2	1	2	4	9	8	36	3
TOTAL	87	55	36	55	24	6	21	24	32	84	128	169	721	61
MEAN	3	2	1	2	1	0	1	1	1	3	5	6	26	2

Table B.2.10 RUNOFF RECORD AT PARAKRAMA SYSTEM H

* SYSTEM - H , IN AND AU
* DIVERSION REQUIREMENTS IN MILLION CUBIC METERS
* IRRIGATION AREA : 42600 HA.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	MEAN
1950	1	61	42	25	83	83	82	74	76	60	76	50	771	64
1951	0	3	47	31	39	83	66	73	61	2	0	1	404	34
1952	3	14	53	35	81	83	70	75	75	16	80	76	661	55
1953	75	82	76	34	83	83	82	75	75	0	19	6	690	58
1954	0	28	15	2	73	83	27	49	77	8	77	0	439	37
1955	0	0	6	11	15	69	67	36	49	17	73	76	421	35
1956	80	82	78	83	83	83	83	77	77	69	24	45	862	72
1957	79	25	78	74	6	59	68	56	74	0	0	0	519	43
1958	0	45	13	59	26	67	83	30	76	13	53	67	532	44
1959	51	93	77	53	6	22	80	67	75	1	2	0	497	41
1960	0	0	4	8	59	72	0	12	71	3	0	6	235	20
1961	9	2	26	53	58	42	83	76	77	1	9	0	416	35
1962	0	0	12	4	2	20	83	66	75	0	5	0	267	22
1963	0	0	0	6	56	83	33	68	73	27	2	0	348	29
1964	0	3	10	22	80	83	40	74	76	2	42	39	521	43
1965	78	40	44	25	8	81	85	13	76	0	0	0	468	39
1966	0	22	14	5	83	82	69	42	44	0	0	0	361	30
1967	3	5	8	22	62	65	73	65	76	0	4	0	431	36
1968	1	29	24	55	80	78	83	61	75	0	10	0	498	42
1969	44	57	71	29	80	83	85	46	75	0	4	0	572	48
1970	0	0	0	21	51	83	71	65	75	4	3	0	373	31
1971	0	2	2	5	21	83	83	22	53	0	33	0	354	30
1972	4	85	78	20	6	59	83	74	75	0	8	0	540	45
1973	33	83	76	83	83	83	63	71	75	56	79	0	785	65
1974	13	73	69	12	26	83	83	78	74	83	83	74	801	67
1975	81	83	75	83	75	83	62	76	76	58	12	47	811	68
1976	77	83	75	34	82	83	79	46	45	6	6	6	622	52
1977	30	50	58	60	6	7	7	34	76	1	1	1	331	28
TOTAL	642	1058	1153	1164	1515	1966	1847	1599	1982	427	705	492	14528	1213
MEAN	23	37	41	42	54	70	66	57	71	15	25	18	519	43

Table B.2.11 AVERAGE MONTHLY INFLOW TO TANKS

Unit: MCM

Month	Kantalai	Kaudulla	Minneriya	Giritale	Parakrama Samudra	Total
Catch-ment (km2)	588	83	385	24	73	-
Jan.	19	2	11	1	3	37
Feb.	10	1	6	0	2	19
Mar.	7	1	4	0	1	13
Apr.	13	2	7	1	2	25
May	8	1	5	0	1	15
June	1	0	1	0	0	2
July	5	1	3	0	1	10
Aug.	5	1	3	0	1	10
Sep.	10	1	6	0	1	18
Oct.	20	3	12	1	3	38
Nov.	31	4	18	1	5	59
Dec.	40	5	23	2	6	76
Total	169	27	99	6	26	321

FIGURES

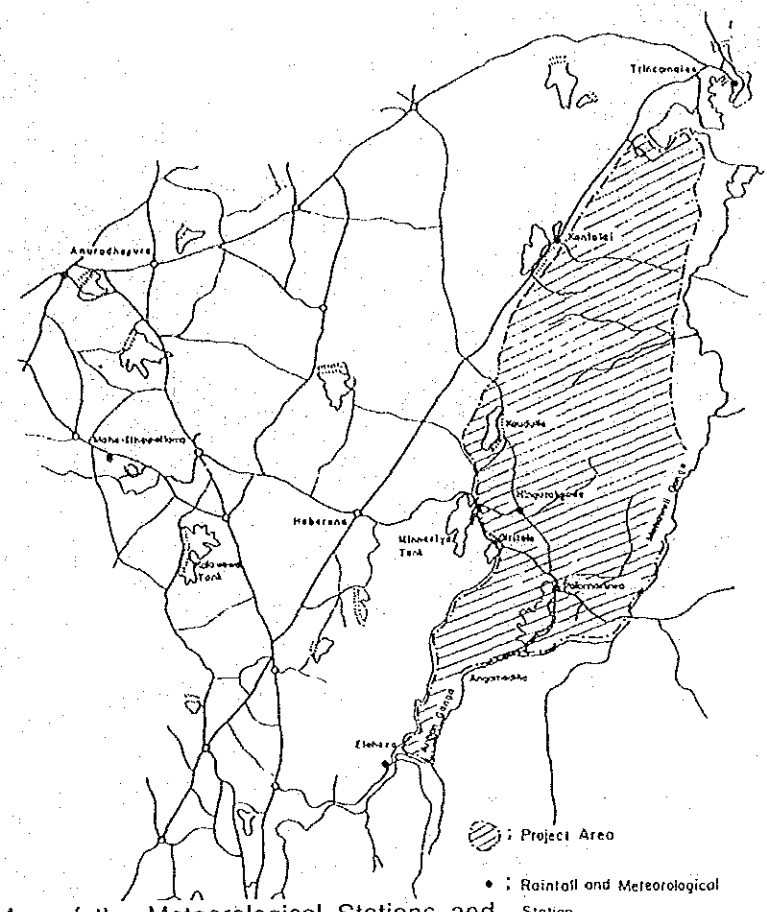

Fig. B.1-1 Location Map of the Meteorological Stations and Other Gauging Stations

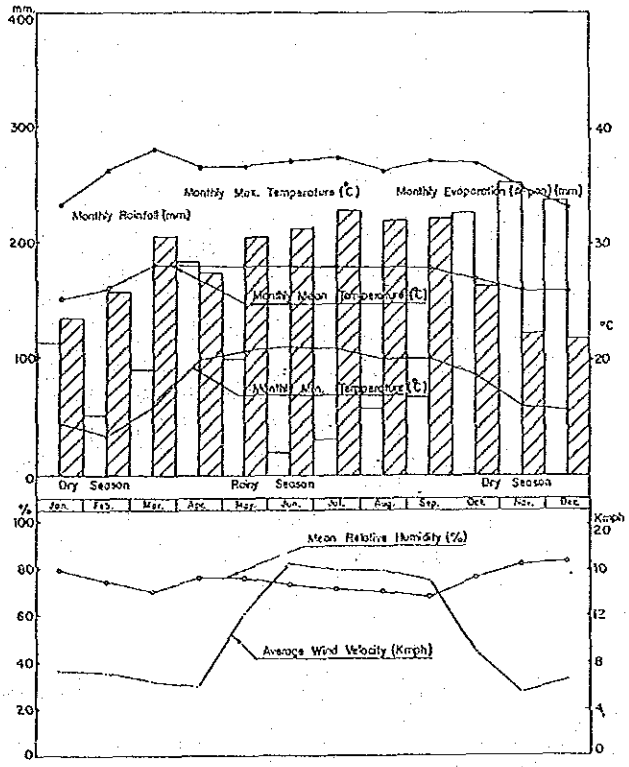

Fig. B.1-2 Characteristics of Climate of Maha-Illuppallama

GOVERNMENT OF DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF MAHAWELI DEVELOPMENT
THE STUDY ON EXTENSION OF THE MORAGAHAKANDA AGRICULTURAL DEVELOPMENT PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

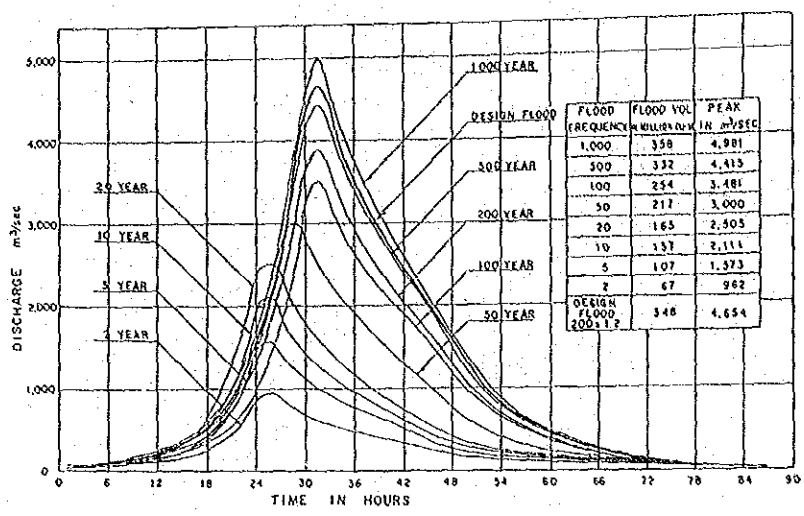

Fig. B.2-1 Flood Hydrographs

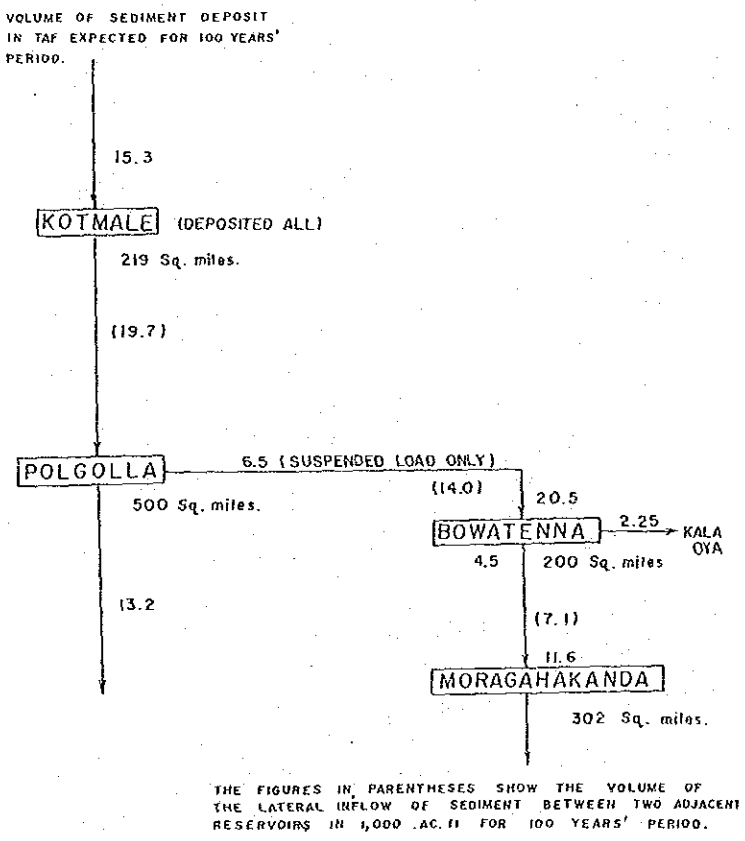

Fig. B.2-2 Sediment Diagram

GOVERNMENT OF DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
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THE STUDY ON EXTENSION OF THE MORAGAHAKANDA AGRICULTURAL DEVELOPMENT PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

ANNEX - C

SOIL AND LAND CLASSIFICATION

ANNEX - C

SOIL AND LAND CLASSIFICATION

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ANNEX-C SOIL AND LAND CLASSIFICATION

C.1 GENERAL

C.1.1 Introduction

This soil report was recompiled on the basis of the Feasibility Study Report on the Moragahakanda Agricultural Development Project (ANNEX III: SOIL SURVEY) prepared by JICA in 1979 (hereinafter referred to as the previous study).

The previous study aimed at identifying major soil groups and their distribution in the newly reclaimed land to evaluate the endowed land resources within the study area. Therefore, the soil map of this report covered an undeveloped area of 43,000 ha (106,270 ac) in Systems A/D, D1, D2 and other on going scheme of System G. The study results can be inferred as being reliable, and no specific change was observed in the previous survey in 1979.

C.1.2 Survey Boundaries

Soil obsevations were carried out on both developed areas and undeveloped areas to compare these two different types of land for the determination of the best soil condition for paddy and upland crops.

Soil chemical analysis of representative twenty one (21) samples also were completed at the soil science laboratory of the Land Use Division of the Irrigation Department (LUD) of the LD in 1979.

Based on the study results, soil maps of Systems A/D, D1, D2 and G were prepared and attached to the report. Areas of each surveyed Systems and number of observations and sampling points are shown in Table C.1.1. Results of the soil and land classification study are described in the following Chapters.

C.2 PHYSIOGRAPHY AND SOILS

C.2.1 Physiography

The study area for the Moragahakanda Agricultural Development Project extends in the lower and north-western part of the left bank of the Mahaweli Ganga, and is bordered by the Mahaweli Ganga on the east, the Amban Ganga on the south, the Elahera-Mineriya-Kantalai canals on the west and Kantalai Sugar factory on the north.

From physiographic point of view, the lands in the soil survey area, except existing paddy field of System D, are classified into six (6) land form categories as shown in Table C.2.1.

The major soil covering the study area are those developed on (1) Mahaweli Flood Plain, (2) Old Alluvium, (3) Gently Undulating Plain and (4) Undulating Plain. These occupy 92% of the total area. The soils developed on (5) Dissected Undulating Plain and (6) Rock Knob Plain are not suited to irrigation farming due to their general features of sandy and/or gravelly texture, shallow soil depth and low inherent fertility, however, the area of these soils is relatively small in extent.

C.2.2 Soil Classification

According to the Sri Lanka soil classification system (C.R. Panabokke, Ph. D., Soils of Ceylon and Fertilizer Use, 1967), the soils of undeveloped area within the project area were identified as Reddish Brown Earth (RBE), Low Humic Gley soils (LHG), Alluvial soils, Solodized Solonets and Lithosols. The extensive major soil units are composed of the RBE, the LHG and Alluvial soils, occupying about 55% (24,000 ha), 16% (6,900 ha) and 20% (7,900 ha) in an undeveloped area of Systems A/D, D1, D2 and existing irrigation scheme of System G as shown in Table C.2.2. The distribution of these soil units are closely related with topography of small catchment area and drainage conditions. According to the drainage catenary association, the RBE and LHG are sub-divided into well drained and imperfectly drained soil units.

The extends of these identified soil units are shown in Figs. C.2-1 - C.2-4. The soil maps were prepared as the medium intensity detailed soil maps on the topographic maps with a scale of 1/63,000 prepared by L.U.D. The major characteristics of the soil units are described below:

(1) Alluvial Soils, well to moderately well drained series

The soils are formed from semi-recent alluvium and occur on river levees and flood plains. They are deep soils characterized by moderately well to well drainability, dark reddish brown to reddish brown colour, and fine sandy loam to fine sandy clay loam texture. In the project area, these soils are observed on levees of the Mahaweli Ganga (System D2) and Amban Ganga (System G). The soils are suited to the cultivation of cash crops such as tobacco, chillies, onion, groundnut in both Maha and Yala seasons, with provision of supplementaly irrigation water.

(2) Alluvial Soils, imperfectly to poorly drained

The soils are formed from semi-recent alluvium and occur on the lower part of the floodplain. They are heavy textured soil, generally with a clay content ranging from 40% to 60% and with 20% to 30% silt and have imperfectly to poorly drainability. The soils of this group are characterized by deep soil, dark grey brown colour, mottlings and gleyed fine sandy clay loam texture. These soils are distributing over zones along Mahaweli ganga with in Systems D1, D2 and A/D. The soils are too wet for cultivation of upland crops. They have been rated moderate suitable for wet land rice.

(3) Low Humic Gley Soils

The soils of this group are formed from the old alluvium and occur on low-lying areas. Generally they are found in association with the RBE soils in a caterany seguence within Systems A/D, D1 and G. They are poorly drained, deep, dark grey coloured and sandy clay textured, overlying olive brown, mottled and gleyed, sandy clay to clay textured soils. These poorly drained soils are best suited for paddy cultivation under lowland condition.

(4) Reddish Brown Earth, well to moderately well drained

These soils occur on areas with the typical ridge-valley landscape. The soils are well drained, moderately deep, dark reddish brown, sandy clay loams underlain by dark red subsoils. On this well drained soils, a wide range of upland crops of the dry zone, namely chillies, onion, groundnut, soya bean, cowpea, green gram, upland rice, maize, sorghum, suger cane, etc. can be grown.

(5) Reddish Brown Earth, imperfectly to poorly drained

The soils of this group are generally found in association with Low Humic Gley Soils. These soils and Low Humic Gley soils generally occur in a catenary sequence in which the poorly drained soils extend from the upper slopes of the ridges towards the valley bottoms with increasingly impeded drainage conditions down to the slope. The soils are deep, dark greyish brown coloured, sandy loam to sandy clay loam textured, underline by yellowish brown, mottled, sandy clay loam to sandy clay textured horizon. These soils could be used for cultivation of rice, sugar cane and pasture.

(6) Reddish Brown Earth, shallow/rock phase

Same as soils of reddish brown earth, except that the gravel layer occurs at relatively shallow depth. These soils are best used as sites for settlement or homestead.

(7) Solodized Solenetz

The soils of this group occur as part of the river terrace where they are in association with Alluvium and Low Humic Gley Soils. They are poorly drained soils characterized by light brownish grey coloured, loamy sand to sandy textured overlaining olive brown, mottled and gleyed, sandy clay horizon. These soils could be used for rice cultivation, although yields could be less due to shallow sandy surface layers that overlying a sandy clayey textured strongly natric (sodic) subsoil.

(8) Lithosols

More than 25% of the surface area in this land unit is covered by rock exposures. The land could be used only for settlements, homestead and building sites.

C.2.3 Results of Soil Observation and Analysis

Soil profile observation was done at 140 points in and around the undeveloped area, and soil samples were taken at 21 selected sites for physico-chemical analysis at the Soil Science laboratory of LUD. The profile sites and sampling sites are shown in Fig. C.2-5.

The results of soil observation and laboratory analysis are shown in Tables C.2.3 to C.2.5 and are summarized as follows:

(1) Soil Reaction (pH)

Method	:	1:2.5 soil : water suspension
Range	:	from 5.4 to 7.1 in surface layers
Interpretation	:	preferred range for crop cultivation

(2) Electrical Conductivity (EC)

Method	:	1:5.0 soil : water suspension
Range	:	from 0.04 to 0.96 (m.mos/cm)
Interpretation	:	No salinity problem will be anticipated

(3) Organic Matter (O.M.%)

Method	:	Walkley-black
Range	:	from 0.6% to 1.8%
Interpretation	:	normally low in organic matter content

(4) Total Nitrogen (%)

Method	:	Kjeldahl
Range	:	from 0.07% to 0.21%
Interpretation	:	normally suitable for crop cultivation

(5) Available Phosphorus (ppm)

Method : Bray (diluted NH_4F))
Range : from 0 ppm to 12 ppm
Interpretation : normally low in available phosphorus content

(6) Cation Exchange Capacity (meq/100 g soil)

Method : ammonium take extraction, adjusted at pH 7.0
Range : from 6.0 to 42.1 meq/100g soil
Interpretation : suitable for paddy and upland crops

(7) Exchangeable Sodium (ES)

Range : from 0.1 to 4.4 meq/10g soil
Interpretation : negligible for sodium effect

(8) Base Saturation (%)

Range : from 85% to more than 100%
Interpretation : Highly saturated by exchangeable bases such as Ca, Mg and Na

C.3 LAND CLASSIFICATION

C.3.1 Land Classification System

The range of crops that can be grown on each soil units based on experience and records on crop production in experimental stations and farms established as preliminary land classification system by Irrigation Department are described in Table C.3.1. The system was taking account of soil factors such as texture, depth (limited by gravel, rock or impervious material), salinity, chemical characteristics and permeability, and was adopted as land classification criterion by using soil classification data in this report.

C.3.2 Results of Land Classification

The land classification for the extension of the Moragahakanda Agricultural Development Project was made in accordance with above mentioned specifications for undeveloped area of Systems D1, D2 and A/C, and the acreage of each classification units is shown in Table C.3.2.

The results of land classification study showed that about 90% of the total area would be suitable for crop cultivation, of which about 30% would be suitable for upland crops, about 29% both for upland crops and paddy cultivation, and 41% would be best suitable for paddy cultivation.

TABLES

Table C.1.1 SOIL SURVEY BOUNDARIES

Survey Area	Area (ac)	Observation Point	Sampling Point
Undeveloped Area			
System A/D	17,910	15	1
System D1	50,480	30	7
System D2	14,700	15	1
Developed Area			
System G	23,180	19	5
System D	-	61	7
Total	106,270	140	21

Table C.2.1 LAND FORM

(Unit : ac)

Land Form Category	A/D	D1	D2	G	Total
(1) Mahaweli Flood Plain	3,760	1,090	14,200	570	19,620
(2) Old Alluvium	1,260	13,790	0	2,050	17,100
(3) Gently Undulating Plain	5,215	16,520	0	5,470	27,205
(4) Undulating Plain	5,510	17,850	130	10,650	34,140
(5) Dissected Undulating Plain	0	980	0	1,860	2,840
(6) Mountains and Rock Knob	2,165	250	370	2,580	5,635
Total	17,910	50,480	14,700	23,180	106,270

Table C.2.2 RESULTS OF SOIL CLASSIFICATION

Mapping No.	Main Soil Unit	Soil Unit	Land Form	A/D		D1		D2		G		Total	
				ac	%	ac	%	ac	%	ac	%	ac	%
(1)	Alluvial Soil	Well to moderately well drained	Floodplain	0	0	0	0	3,650	25	570		4,220	4.0
(2)	Alluvial Soil	Imperfectly to poorly drained	Floodplain	3,760	21	1,090	2	10,500	71	0		15,400	14.5
(3)	Low Humid Gley Soils		Old alluviam	1,260	7	13,790	27	0	0	2,050		17,100	16.1
(4)	Reddish Brown Earth	Well drained	Undulating plain	5,510	31	13,100	26	130	1	7,370		26,110	24.6
(5)	Reddish Brown Earth	Imperfectly drained	Undulating plain	5,215	29	16,520	33	0	0	5,470		27,205	25.6
(6)	Reddish Brown Earth	Shallow/rocky phase	Undulating plain	0	0	2,130	4	0	0	3,280		5,410	5.1
(7)	Solonets		Old alluvium	0	0	2,620	5	0	0	0		2,620	2.5
(8)	Rock Knob Plain		Rock knob	2,165	12	250	1	370	3	2,580		5,365	5.0
(9)	Erosion Reminents		Dissected undulating plain	0	0	980	2	0	0	1,860		2,840	2.6
	Total			17,910 (7,250 ha)	100	50,480 (20,430 ha)	100	14,700 (5,940 ha)	100	23,180 (9,380 ha)		106,270 (43,000 ha)	100.0

TABLE C.2.3 RESULTS OF SOIL OBSERVATION

Horizon		R.B.E.		L.H.G.
		Well drained	Imperfectly drained	
A	Depth (cm)	0 - 15	0 - 40	25 - 30
	Colour	Dark/brown.	Dark brown	Dark gley brown
	Texture	SL, SCL	SCL, SL	LS, SL
B	Depth (cm)	15 - 110	40 - 90	30 -
	Colour	dark reddish brown to reddish brown	Dark yellowish brown	Light gley brown
	Texture	SCL	SCL	SCL, SC
C	Depth (cm)	110 - 150	90 - 120	
	Colour	Light yellowish brown	Yellowish brown	
	Texture	-		

Table C.2.4 MODEL PROFILE (1/2)

Classification: Alluvium - Well drained to Mo well draned

Depth	Colour	Texture	Moisture, Structure, Consistence, Cutants, Gravels, Concretion, Pores, Roots, Motting, etc.
0 - 4	10 yR 4/2	S1 to C1	Organic Matter, ns & np (W)
4 - 18	Varying colour	C1	ns & np (W) to SS & Sp
18 - 40	10 yR 5/4	C1	SS & Sp (W)
40 - 48	10 yR 5/3	C1	SS & Sp (W) few soft MN Concretion

Classificationn: L.H.G.

Depth	Colour	Texture	Moisture, Structure, Consistence, Cutants, Gravels, concretion, Pores, Roots, Motting, etc.
0 - 4	10 yR 3/2	S1-SC1	Slight organic matter ns & np (W) faint mottles of colour 7.5 yR 4/4
4 - 14	10 yR 4/3	SC1	C1d mottles of colour 7.5 yR 4/4 SS & Sp (W) slightly gleyed by 5/1 few soft MN concretion
14 - 24	2.5 y 5/2	SC1	C1d mottles to C2d mottles of colour 7.5 y 4/4 SS & Sp (W) to S & p Common gleying 5 y 5/1 few soft MN concretion
24 - 40	2.5 y 5.2	SC1 - SC	C1d to C2d mottles of colour 7.5 yR 5/6 Common gleying of colour 2.2 yR 6/2 few soft MN concretion S & P (W)
40 - 48	5 y 5/1	SC	C2d mottles of colour 7.5 yR 5/6 Common gleying; Commons soft MN Concretion S & P (W)

Table C.2.4 MODEL PROFILE (2/2)

Classification: R.B.E. Imperfectly drained

Depth	Colour	Texture	Moisture, Structure, Consistence, Cutants, Gravels, Concretion, Pores, Roots, Motting, etc.
0 - 4	10 yR 4/2	Sl	Slight organic matter ns & np (W)
4 - 12	10 yR 4/3	Scl	SS & Sp (W) faint mottling; Mottle colour 7.5 R 4/4; few soft MN concretion
12 - 28	10 yR 4/4	Scl	SS & Sp (W) C1d mottles of colour 7.5 yR 4/4 feldspar few soft MN concretion
28 - 40	10 yR 5/6	Scl	SS & Sp (W) C2d mottles of colour 7.5 yR 4/4 feldspar few soft MN concretion
40 - 48	10 yR 5/6	Scl	SS & Sp (W) C2d mottles of colour 7.5 yR 4/4 few Iron Stones, MN strains
48 - 54	10 yR 5/3	Scl-grscl	SS & Sp (W) C1p mottles of colour 7.5 yR 4/4 feldspar; MN strains

Classificationn: R.B.E. - Well drained

Depth	Colour	Texture	Moisture, Structure, Consistence, Cutants, Gravels, concretion, Pores, Roots, Motting, etc.
0 - 4	5 yR 4/2	Sl, Scl	Slight organic matter ns & np (W)
4 - 12	5 yR 4/3	SCl	SS & Sp (W); mica feldspar; few soft MN concretion
12 - 28	5 yR 4/4	Scl	SS & Sp (W); mica feldspar; few soft MN concretion
28 - 36	5 yR 4/6	Scl	SS & Sp (W); mica feldspar; few soft MN concretion
36 - 40	2.5 yR 4/6	Scl-grscl	SS & Sp (W); mica feldspar; few soft MN concretion
40 - 44	2.5 yR 4/	gr Scl	SS & Sp (W); to S & P (W) few mica, feldspar; MN strains
44 - 48	10 R 4/6	gr Scl	S & p (W); mica feldspar MN concretion

Table C.2.5 RESULTS OF SOIL LABORATORY ANALYSIS

Sample No:	pH 1:2.5	E.C. 0.05 m.mhos cm	pH 1:2.5 kcl	CEC Meq/ 100 g	Ca Meq/ 100 g	Mg Meq/ 100 g	Na Meq/ 100 g	K Meq/ 100 g	Org/C%	N%	P ppm	P (Abs Coeff:) mg/100 g	Ex H
R.B.E. well drained soil													
D2 D4 78/240	5.90	0.07	4.80	9.62	5.25	2.49	0.20	0.133	0.96	0.074	Nil	-	5.74
D1D 1	6.10	0.08	5.60	10.03	7.04	2.24	0.16	0.325	1.33	0.099	3	1,300	4.28
D1U 2 78/232	6.70	0.05	5.50	10.48	7.43	2.80	0.18	0.112	0.99	0.071	Nil	-	3.81
G 5 (Good)	6.90	0.06	5.60	12.89	7.37	4.38	0.18	0.213	0.79	0.157	Nil	3,850	4.80
G 6 78/224	6.50	0.11	5.45	10.96	5.85	2.65	0.18	1.381	0.59	0.092	4	2,600	3.83
G 11 Poor	5.40	0.06	4.70	11.06	6.87	2.48	0.10	0.089	0.77	0.099	3	3,000	5.73
R.B.E. imperfect drained soil													
D2D 8 78/242	6.75	0,96	5.40	8.58	7.08	1.62	0.10	0.150	0.66	0.079	9	750	3.81
D1U 18 78/235	6.30	0.04	4.90	10.39	7.11	2.39	0.10	0.151	1.10	0.089	3	1,750	4.30
G 17	6.00	0.07	5.30	10.57	6.90	3.41	0.18	0.086	0.87	0.092	63	5,400	0.00
D1D 10	6.10	0.07	5.50	11.43	6.92	4.07	0.18	0.125	1.68	1.121	7	-	4.00
D 16 78/246	6.65	0.05	5.20	10.21	7.04	1.19	0.15	0.431	1.24	0.120	3	2,250	5.28
D1U 4 78/233	6.70	0.23	5.60	19.55	14.50	6.47	0.34	0.152	1.31	0.082	Nil	1,250	4.42
Ad 4	6.10	0.04	5.30	10.31	6.88	3.33	0.18	0.103	1.19	0.101	3	-	5.86
L.H.G. soil													
D1U - 1	7.05	0.74	6.00	42.12	25.53	14.23	4.44	0.349	1.47	0.153	12	-	8.91
D1U 1 - poor 78/231	7.00	0.08	6.10	14.22	10.40	4.72	0.31	0.258	1.58	0.075	2	-	2.91
D1U 11	7.10	0.10	6.00	10.12	6.07	3.64	0.36	0.177	0.83	0.057	Nil	1,500	2.85
D1U 12 poor	5.80	0.06	5.10	9.42	6.45	2.06	0.13	0.133	0.99	0.077	Nil	2,400	3.81
D1U 21	6.80	0.11	5.80	22.49	13.80	8.78	0.21	0.223	1.80	0.116	Nil	-	5.82
D1U 24 78/237	7.10	0.11	5.40	6.05	2.74	1.82	1.09	0.091	0.05	0.084	12	1,150	0.97
D2D 9 poor Y	6.06	0.55	4.80	11.14	6.74	3.61	0.20	0.109	0.56	0.076	10	2,600	5.21
D2D 3 78/238	6.30	0.07	5.30	18.05	11.80	4.83	0.26	0.142	1.25	0.138	10	-	7.39
Alluvial soils													
D2U4 78/239	6.70	0.09	5.70	20.01	14.30	4.87	0.23	0.310	1.77	0.208	5	4,250	-

Tale C.3.1 DESCRIPTION OF SOIL CLASSIFICATION

Classification Unit	Soil Unit	Definition
Upland Crop Type	Reddish brown earth (well drained) Alluvial soil (well to moderately well drained)	Suitable for a wide range crops such as cotton, groundnut, sugarcane, pulses, soyabeans, chillies and vegetables.
Lowland and Upland Crop Type	Reddish brown earth (imperfectly drained)	Suitable for intermediate crops, which can tolerate periodic wetness on the surface, such as sugarcane on ridges.
Lowland Crop Type	Low humic gley soils Alluvial soils (imperfectly drained)	Suitable fow lowland paddy.
Unsuitable to Crop Type	Solonetz, reddish brown earth (shallow/rocky phase) Rock knob Erosion remarks	Very poor to poor lands, and unsuitable for crops.