FEASIBILITY REPORT

ON

THE REHABILITATION OF TANK IRRIGATION PROJECT

VOLUME II - ANNEXES

MARCH 1988

GRAN CHACO NATIONAL COOPERATION AGENCY

THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

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JAPAN INTERNATIONAL COOPERATION AGENCY

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1. APPROACH AND METHODOLOGY ADOPTED IN THE FIELD SURVEY

1.1 APPROACH

1.1.1 Basic Concept

From the very commencement of the Field Survey for the Phase II the Study Team has conceptualised its basic approach upon the foudation of its understanding and appreciation of the Sri Lanka Government's policy regarding the development of the rural economy.

The optimum project plan has to be formulated keeping in constant focus the ultimate objective which is the upgrading of income and living standards of the villagers in the Minipe and Nagadeepa areas. For this purpose it is necessary that all the relevant factual data pertaining to the two Schemes should not only be carefully perceived and accurately recorded, but that their total significance should be fully appreciated both as individual factors taken in isolation and as interconnected components of a cohesive whole.

The various aspects of our basic approach may be summarised in the following terms:

(a) to identify all the relevant conditions and all the physical features as exist within the Proejct Areas by actual observation in the field;

(b) for this prupose to establish and maintain contact during the period of the study not only with Government Officers, non-Government-Organisational officials, but also with the villagers themselves with a view to getting information at first hand through mettings and discussions with them;

(c) to use scientific methods to measure wherever possible and record quantitatively all the relevant data and generally to make as objective an analysis as possible;

(d) to select representative sample areas for intensive investigation with a view to obtaining a deep and through understanding of such areas that would serve the purposes of the total Study, (details of the mode of selecting sample areas being given in the succeeding paragraphs) and

(e) finally, to examine and report on all aspects of the Project in its totality against the background of, and in relation to, similar Projects in Sri Lanka without restricting the study to the Project Areas themselves.

1.1.2 Selection of Sample Areas for Intensive Investigations

Time did not permit us to undertake a comprehensive survey of each of the two project areas in entirety. We therefore, decided to select a few representative Sample Areas within each of the two Schemes for an intensive and in-depth study of the various aspects covered by this Report. We intended by so doing to be enabled to comprehend, and grasp the full significance of, the somewhat complex social and economic situation prevalent as effectively and as accurately as possible. As would be evident from the later sections, some of the aspects that we so studied in depth are the irrigation system, the water management activities, land tenure, agriculture and employment among others. The actual method we employed in selecting the Sample Area, (six for Minipe and two for Nagadeepa) is indicated in the succeeding sub-paras.

(1) As is generally known and as is indicated hereafter the different stages (i.e. Stage I, Stage II and Stages III, IV) differ among themselves not only in terms of year of Settlement and unit of alienation, but in respect

of other aspects as well. We have, however, used the water distribution system as the criterion for determining the six blocks to which the Minipe Scheme could be demarcated for purposes of selecting sample areas:

The water distribution system sustained by the respective distributary canals (D-canals, while conferring homogeneity on those governed by one system, also distinguishes them from those governed by another system.

The six Blocks are:

Stage I - Section I (I-1), Stage I - Section 2 (I-2)

Stage II - Section I (II-1), Stage II - Section 2 (II-2)

Stage III, and Stage IV

Having determined the six Blocks the next step was to select a typical D-canal in each such Block. The criteria for selecting D-canal were as follows:

(a) largeness of extent of area benefitted by the canal;

(b) suitability and convenience of the area for the water balance survey; and

(c) extent of development of the area towards a cohesive village unit.

Block I-1 - the D-canal No. 21 was selected from among 43 canals. This is a relatively large area compared with the other D-canal areas. It is part of the village called Handagamuwa and is a typical old settlement area in this Scheme.

In Block I-2, there are some temple lands in which the conditions of land tenure are different from elsewhere. In order to use a typical area in terms of

farm management and water use, the largest D-canal area (107 ha) D47, where there is no temple land, was selected out of 30 turnouts in this Block. This area is part of the village of Gurulupotha.

From Blocks II-1 and II-2, for the same reason, the D-7 area (130 ha) and the D31/32 area (68 ha/80 ha) were chosen respectively for detailed investigation. D-7 area is the village called Keenapalessa, and D-31/32 areas are in the Weragama and Kolongoda villages both of which are typical areas in Stage II from a socio-economic point of view.

There are 7 minor reservoirs for irrigation in Stage III, and the area served by them covers over 800 ha which is more than half of the total irrigated area in this Block. For this reason an irrigation area by a reservoir, the Mahawatenne Wewa area (170 ha), which is the largest among the reservoir areas was chose for intensive survey. This area is one of the parts of the Wilgamuwa region called Mahawatenna village.

From Stage IV, the tail-end zone of the Minipe main canal D-3 (272 ha) a typical tail-end area was selected in consideration of water distribution. This area called Madaganda village is representative of areas severely hampered by lack of irrigation water and characterised by the backwardness of the socio-economic infrastructure.

The location and general feature of each selected area mentioned above are indicated in Figure 1.1.1 and Table 1.1.1.

(2) Nagadeepa

The concept of the village rather than the water distribution system is the predominant factor in Nagadeepa.

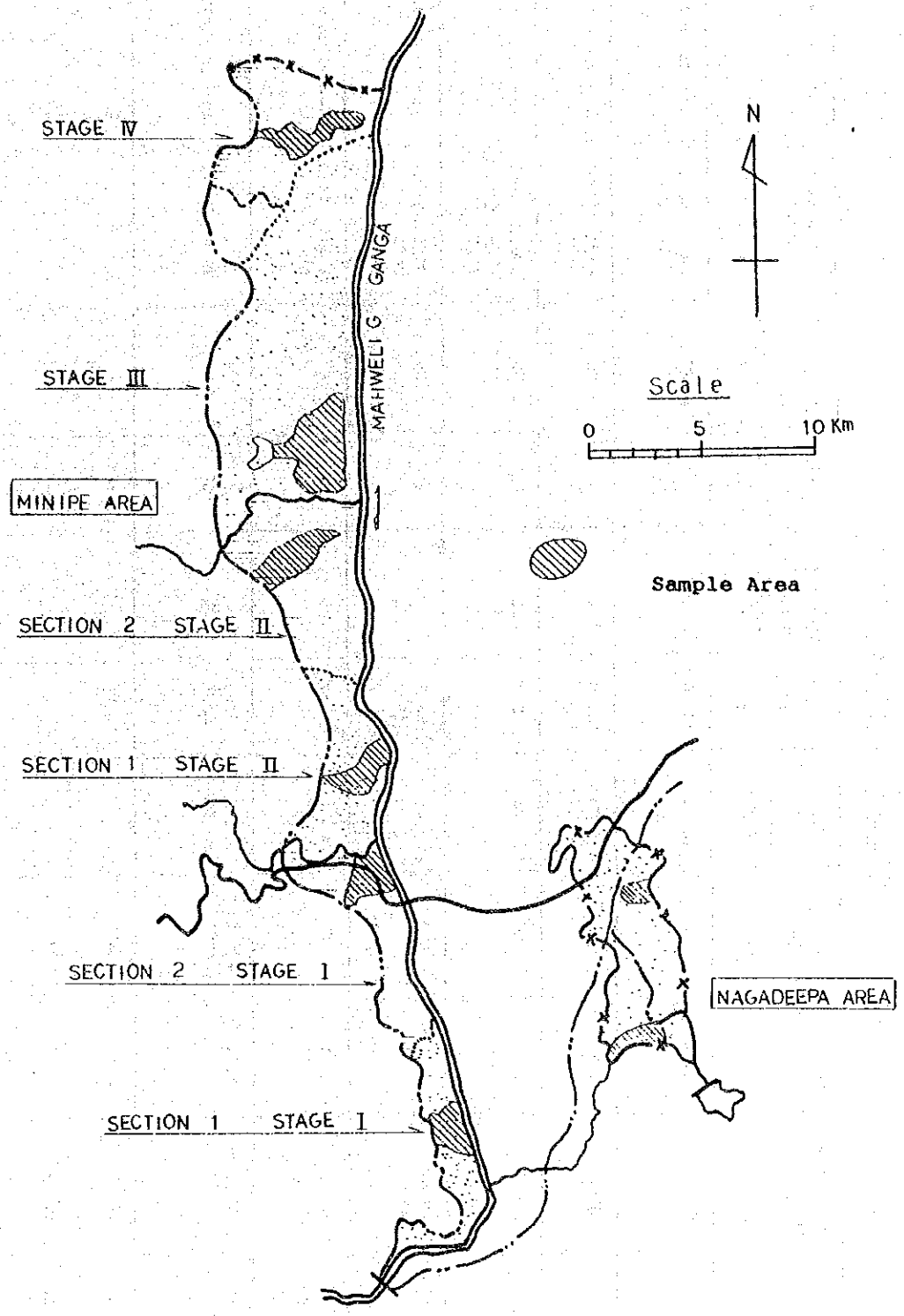

Fig.1.1.1 SAMPLE AREA

Table 1.1.1a OUTLINE OF SAMPLE AREA

Survey Block	Name of Sample	Irrigable Area ha	Length of D/Ca: KM	No.of F.Canal Nos.	First date of water issue	Cultivation Area		Cultivation method		Variety of Paddy	Land Preparation period	Sowing period
						Paddy ha	Other Crops ha	Direct Sowing %	Trans-planting %			
I - 1	D 21	149.8	1.95	5	Apr 25	143.8	6.1	10	90	94/1,34/8, 34/6 380	Apr 28 to May 15	May 20 to Jun 05
I - 2	D 47	107.0	1.67	3	Apr 25	105.0	2.0	-	100	94/1,400/1 34/6	Apr 28 to May 20	May 20 June 05
II-1	D 7	129.6	2.86	23	Apr 25	128.0	1.6	20	80	380/2,279/2 94/1,34/8, 90/2	Apr 30 to May 25	May 25 to June 10
II - 2	D/31,32	63.6/ 80.2	1.04/ 2.92	7/5	Apr 25	63.6 79.0	- 1.2	30	70	34/8,34/6, 94/1	Apr 28 to May 20	May 20 to May 30
III-1	Mahawa-Tennawewa D/Ch1	170.1	3.65	27	May 01	145.0	1.2	100	-	276/5, 34/6 34/8	May 10 to May 31	May 20 to June 10
IV	D/3	271.7	3.34	2(D.C) 33(FC)	Apr 27	56.7	17.0	100	-	34/8,275/5	Apr 28 to May 15	May 20 to May 30
Naga-deepa	Tract 3	174.2	3.55 (D1)	25	-	-	-	-	-	-	-	-
	Tract 12	191.9	1.27 (D2) 1.22 (D1)	34	-	-	-	-	-	-	-	-

Table 1.1.1b OUTLINE OF WATER BALANCE STUDY AREA

Survey Block	Name of Sample Area	Irrigable Area ha	Water Balance Study ha	Related Canal	No. of Measuring Points Nos.	Cultivation method		Variety (Paddy)	Land Preparation period	Sowing Time	Remarks
						Direct sowing %	Trans-planting %				
I - 1	D 21	149.8	13.0	FC 1 FC 2	13	05	95	34/8, 94/1 380	Apr 25 to May 10	May 10 to May 20	Water Distributor A.K.B.Samarakoon
I - 2	D 47	107.0	20.0	LB 1-3	14	-	100	94/1,400/1	Apr 28 to May 20	May 20 to June 05	W.M. Gunasekera
II-1	D 7	129.6	13.4	-	17	10	90	380/2,379/2	Apr 30 to May 30	May 15 to May 30	R.M.D. Samarakoon
II-2	D/31,32	6.36/80.2	53.0	-	24	40	60	34/8, 34/6 94/1	Apr 28 to May 20	May 20 to May 30	S.B. Dissanayake
III	Mahawa-tenne-Wewa	170.1	71.9	D.Canal RB8-11	08	100	-	34/8, 34/6 276/5	May 10 to May 31	May 20 to June 10	H.B. Thilakaratne
			28.6	FC24-27	05	90	10	34/8,275/5	Apr 27 to May 10	May 12 to May 24	A.M. Kuda Banda
IV	D 3	271.7	14.2	FC33-39	08	100	-	34/8,275/5	Apr 28 to May 15	May 20 to May 30	

It is guided by this consideration that Tract 3 (174 ha) and Tract 12 (192 ha) at the head end and the tail-end of the main canal were selected, the two ends been favoured for purposes of regional comparison. These two areas not only exhibit the characteristics of the village but are also representative of the surrounding areas.

1.2 METHODOLOGY

1.2.1 Socio-Economic Survey

The Socio-economic conditions of the Project Areas have been analysed in terms of the human population, financial status, the input/output of agricultural production and other economic activities in these areas.

The main object of this Phase II Study has been to identify existing constraints on development. In the identification of these socio-economic problems, we have tried to be as objective as possible by using accurate figures and satistical data.

(1) Data Collection and Analysis of the Collected Data of the Various Administrative Levels

It is essential to understand the socio-economic condition in terms of human beings and their circumstances.

The Project Areas come under the administrative control of various authorities at the District Level and at the Divisional Level and are subject to influence at the village level. These authorities may be tabulated as follows: (see Table 1.2.1.)

Table 1.2.1

Project Area	Formal Authorities		Informal Authority
	Administrative District Level	At Divisional Level	At Village Level
Minipe I/Ii	Government Agent, Kandy	Asst.Government Agent, Hasalaka	Village Leader
Minipe III/IV	Government Agent Matale	Asst.Government Agent, Wilgamuwa	Village Leader
Nagadeepa	Government Agent, Badulla	Asst.Government Agent, Ridimaliyadda	Village Leader

It is only by a satistical analysis of the human population that one can get to know the socio-economic conditions of the people in the Project Areas. Close contact with the officials and persons mentioned above had to be established to obtain the data required for determination of population trends and employment prospects.

(2) Visits to Offices and Service Centres for Collection of Data and Their Analysis

There are several offices and service centres located in both Areas as follows: (see Table 1.2.2.)

Table 1.2.2

Institution	Minipe				Nagadeepa
	I	II	III	IV	
Agrarian Service Centre			1		1
Agriculture Extension Office	1	1	1		1
Colonisation Officer's Office	1	3	2	1	2
Co-op Main Office	1	1	1		- (branch -5)
Rural Bank	5	5	1		1
People's Bank	1		1		-
Bank of Ceylon	1		1		-
Paddy Marketing Board Stores	7	2	4	1	-

In order to ascertain the situation obtaining at present, the Team visited these offices/centres as frequently as possible to meet with local officers who are well acquainted with the conditions prevalent in the Project Areas. Agricultural service functions such as the supply of inputs, agricultural credit, the marketing and processing of agricultural products and the price trends for agricultural commodities were intensively studied by visiting the Co-operatives, Banks, and, in particular, the Agrarian Service Centres in both Minipe and Nagadeepa.

(3) Holding Inter-organisational Meetings through the Key Person (Project Manager)

Both the Minipe Scheme and the Nagadeepa Scheme have each a Project Manager who is responsible for the management of the Scheme. They are

for the Minipe Scheme

Mr. P. Nawalage, Project Manager with his office at Morayaya; and

for the Nagadeepa Scheme

Mr. H. W. Panyadasa, Agricultural Officer, with his office at Mahiyangana.

The Project Manager is empowered to call meetings of government officials involved in the Scheme and of farmers at times and places indicated. One of the basic methodologies adopted for investigating agricultural services, including credit, marketing, extension, input supply and their inter-relationships was to hold an inter-organisational meeting in each Scheme with the assistance of the Project Manager. The inter-organisational meeting enabled the Team very effectively to deepen their understanding of the functions, and the relationship of the several

organisations with one another. Such meetings were held twice during the field survey in each Project Area.

(4) Intensive Investigations and Analysis in the Sample Areas

Sample Areas were selected in each Scheme in order to conduct detailed investigations of the employment opportunities, land tenure, and the surrounding circumstances of rural life. The actual survey was carried out with the participation of the Project Manager, village leaders, farmer representatives and water distributors in each Sample Area.

(5) Multi-personal Interviews with the Farmers in the Project Areas

For comprehensive study on the socio-economic conditions it is desirable that an in-depth study should be made not only from the point of view of governmental authorities but also from the point of view of the farmers themselves. The device of the multi-personal interview was availed of both in the Sample Areas and in the other areas to ascertain at first hand the problems with which farmers are confronted. The multi-personal interview was the basic method used to deepen our understanding of the situation in which the farmers in both Areas find themselves. This was done by Team Members participating as observers in the meetings of the Project Committee and Sub-Project Committees in each Area.

1.2.2 Soil Survey

The main purpose of this soil survey, in the light of the overall objectives of this Study, was understood to be the provision of fundamental data on the mechanism of water use in paddy fields in the Project Areas. In the soil survey

therefore, the following items were selected for investigation from the various factors which are connected with the control of water movement in the field. The components of the soil survey so investigated were as follows:

(1) To confirm the soil texture constituting the soil profile and to investigate the soil layer sequences and their depth;

(2) To measure water percolation in the paddy fields;

(3) To undertake the field surveys, special attention being paid to the reduced and oxidized layers containing iron oxides and manganese dioxide and to confirm their colour development.

(4) To measure water permeability of soil samples taken from paddy fields; and

(5) To measure redox potential (oxidation reduction potential) in fields.

Soil Survey points in Minipe and Nagadeepa Area are shown in Figure 1.2.1.

1.2.3 Irrigation and Water Utilization Survey

(1) Causes of Water Wastage

Irrigation Water is a scarce resource and its procurement under major irrigation schemes involves not only considerable financial outlay for intial construction, and but also annual expenditure on operation and maintenance of irrigation systems. Quite apart from its financial implications, irrigation water is the very lifeblood of agricultural production in the Dry Zone and the Intermediate Low Country Zone in which Minipe and Nagadeepa are located.

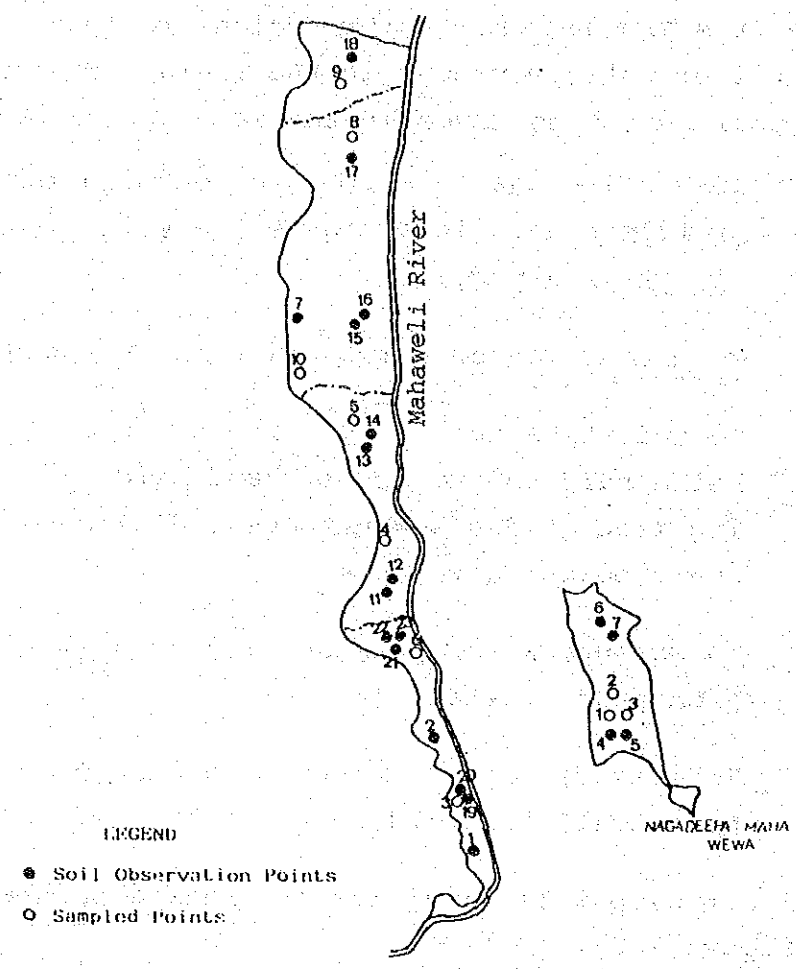

Fig. 1.2.1 SOIL SURVEY POINTS

In view of these factors, considerable attention has been focussed over the last few decades on water management to ensure the efficient and equitable use of irrigation water, particularly under the Major Irrigation Schemes such as Minipe and Nagadeepa. Furthermore, as is shown elsewhere in this Report, Government has devised various institutional forms to achieve this same objective and Minipe has been the focal point of operation of such institutions. Particular attention has been paid to this matter in the Minipe Scheme in view of the fact that wasteful

use of water by the head-end farmers (in Stages I & II) would result in farmers at the tail-end (Stages III & IV) being partially or totally deprived of irrigation water even in Maha.

There has been a tendancy to treat the farmers alone as the culprits for the misuse of irrigation water without paying sufficient heed to other factors that could lead to wastage of irrigation water. We have tried in this Study to identify, and describe in some detail, the causes of such waste in order to affix responsibility therefor and to take such remedial measures as necessary to prevent the occurrence of such waste.

(2) The Team accordingly undertook an intensive and scientific observation and measurement under the following heads to assess accurately the present condition of irrigation water utilization in the Schems:

- Acreage of Cultivated Area
- Water Requirement Survey
- Irrigation System Loss Survey
- Deterioration Survey

(a) Acreage of Cultivated Land

The Acreage of cultivated land was verified for each turnout on the main canal, Branch Canals and Tanks, reference being made to the 1: 10,000 scale topographical map, the Blocking-Out Plan (BOP) and field investigations.

Considerable attention was paid to the location and assessment of the extent of encroachments.

Lands set apart as reservations, i.e. for channels, roads and for common purposes were checked with the BOP first and then verified by site investigations.

(b) Water Requirement Survey in Minipe Area

The field investigations on water requirement were conducted in respect of the following aspects. i.e.

- Water Requirement in depth;
- Percolation; and
- Water Balance

i) Investigations of Water Requirement in depth

The investigations on Water Requirement in depth were conducted in the Water Balance Study Area (Study Area) first, with 12 numbers of bottomless oil drums cut in two pieces and cleaned. The drums were installed on the basis of two points for each Study Area, i.e. one was installed at the upper end of the terraced field, and the other in the middle section, since the water requirement at the upper end would be greater than in the middle section of the field.

The next step was taken late in July in the light of the investigations on the water requirement referred to above and the soil investigations. The drums were installed in Stage I and Stage II along the same contour so as to cover a wider area. Measurement was done by the "Jalapalakas" (Water Distributors) under the guidance of the Team Members, the water depth readings being taken from the bottom nail at peg in drum with 1 mm graduated scale. Measurement in the Study Area was generally taken around 6 AM and 6 PM, except in the case of ten drums installed late in July 1985, where it was around 9 AM.

ii) Percolation

The investigation was conducted in the fields where the drums were installed in the Study Area, with the quick percolation measuring apparatus.

iii) Water Balance

Study Areas surrounded by roads, irrigation canals and drainage canal at the downstream were selected for each Sample Area to minimize number of inflow and outflow points for easy study. Measuring devices; such as the V-notch weir, the Rectangular weir, were installed at the diversion point of the canals and of the drainage canal of the area.

Existing concrete canals and drops were also considered as measuring devices in cases where it was difficult to measure by weir. Measurement of water depth was done by the Jalapalakas around 6 AM and 6 PM with stuff gauge installed near the weirs, since water flow would be stable at these times.

(c) Irrigation System Loss Survey

i) Measurement of Water Depth in Main Canal

The Water depth of the main canal was measured to assess the canal loss and time-lag of flow. The measurement of water depth in the main canal had been started by the Irrigation Department at Hasalaka in April 1983. The water depth had been measured on 17 numbers of Gauging Stations at 6 AM daily.

The team checked the daily record of water depth, and found that it was difficult to

assess the canal loss and time-lag merely by the variation in water depth.

Accordingly it was decided that further investigations were required to obtain a more detailed variation of water depth.

This investigation was done by the Team during the Period 16th to 31st July, measurements being taken every three hours from 6 AM to 6 PM at the following locations viz:

G1, G4, G6, G7, G9, G12, G13, G14, G16, G17

ii) Canal Loss in the Main Canal

The following sections were utilized to assess the Canal Loss in the main canal.

Stage I : Between G1 and G6

Stage II : Between G6 to G12

The discharge conditions at G1, G6 and G12 to be evaluated were selected between 16th July and 22nd July from hydrograph over three hours observed as follows:

- Maximum flow at Upstream Gauging Station (UGS) and maximum flow at Downstream Gauging Station (DGS) corresponded to maximum flow at UGS at the time the turnouts were closed.
- Maximum flow at UGS and minimum flow at DGS when the turnouts were opened.

Discharge to D-canal was assumed with average value stated in para 3.2.3 (3) (v), during evaluation of Canal Loss.

The leakage from the canal facilities was measured as follows:

- Amount of leakage was measured on Turnout and Canal Spillway when the turnouts were closed.

- Amount of leakage was measured with measuring cylinder, weir or current meter, taking into account the condition of leakage at site.

The absorption loss of wetted perimeter was estimated with the following equation developed for Punjab soils:

$$K = 2.11 \times Q^{0.065} \times 10^{-6}$$

where K is absorption loss in Cumec per Sq. meter of wetted perimeter.

Q is discharge in cu.m/sec

The evaporation from the water surface was estimated for the total extent of the water surface of main canal and the river crossings taking into consideration the pan evaporation at Girandrukotte.

Canal Loss has been indicated in two modes as follows:

- Indicated in Cumec

  The difference between upstream discharge and downstream discharge is considered as Canal Loss.

- Indicated in percent

  Canal Loss can be worked out by the following equation.

$$P = (1 - (Ad/Qu)^{1/L}) \times 100$$

  where, P is Canal Loss in percent per km.
  Qd is discharge at downstream in Cumec
  Qu is discharge at upstream in Cumec
  L is canal length in km

The deterioration loss was estimated as the difference of the canal loss during opening and closing time of Turnout. Deterioration Loss of main canal was assessed, comparing the estimated loss with observed leakage discharge from canal facilities.

iii) Time-lag in Main Canal

Time-lag has been taken as the difference between the time of maximum discharge at upstream and the time of maximum discharge at downstream corresponding to the upstream discharge.

iv) Canal Loss in D-canal in Minipe Area

It is necessary to estimate canal loss in D-canal for designing canal discharge. Discharges were measured at two cross-sections of the D-canal at a distance of 300 meters approximately, and discharge to F-canal were measured at the same time if water issues were being made. The canals investigated were D-21 in Stage I, D-7 in Stage II, D-47 in Stage III and D-3 in Stage IV.

v) Irrigation Water Delivery to D-canal in Minipe Area

The discharges through the Turnout on main canal were measured a further four times during the field work to estimate amount of water issued. Measurement was executed in the following cases, considering the rotational issue of irrigation water from main canal:

Case 1, Turnout gates were opened in Stages I, II, III, IV

Case 2, - do - in Stages I, II, IV

Case 3, Turnout gates were opened in Stages I, III, IV

Case 4, - do - in Stages III, IV

Conditions of D-canal selection were:

i) More than 50 ha of irrigable area

ii) Easy for measurement of water velocity

The number of D-canals selected are as follows:

Stage I : D12, D16, D21, D25, D31, D34, D45, D47

Stage II : D4, D7, D11, D17, D25, D27A, D30, D31, D32

Stage III : D43, D47, D57

Stage IV : D1, D2, D3, FC76

vi) System Loss Survey in Nagadeepa Area

No survey on System Loss in Nanadeepa Area has been done, since no water was issued during the period of the Teams visit.

(d) Deterioration Survey

The investigations on irrigation facilities were executed to check number, location, dimension, magnitude of deterioration, defects and problems that had occurred due to deterioration, the rehabilitation efficiency expected on following items:

- Longitudinal and Cross-section survey of main canal

The Minipe Area	75 km
The Nagadeepa Area	20 km

- Inventory Survey of Facilities

  The Minipe Area

Main Canal	75 km
D-canal (7 Numbers)	16 km
F-canal (93 Numbers)	43 km

- Nagadeepa Area

Main & Branch Canal	20 km
D-canal (2 Numbers)	5 km
F-canal (33 Numbers)	12 km

- Data was collected at the following office:

Irrigation Department (I/D)	Head Office
	Kandy D.D. Office
	Hasalaka I.E. Office
	Mapakada I.E. Office
Project Manager Office :	Morayaya
	Mohiyangana

- Discharge Survey of Main Canal
- Discharge Survey of D-canal
- Functional inspection of irrigation facilities and leakage from the facilities

Present condition of facilities was graded to four rank with the magnitude of deterioration as follows:

Rank	Condition
A	- Good condition - No deterioration
	- No serious problems will occur within 10 years
	- No defect
	- No need for rehabilitation

Rank	Condition
B	- Some parts are bad - partly deteriorated
	- Need partial repair
	- No problems at present but no guarantee in future
	- Small defect
C	- Deteriorated. In Need of entire rehabilitation
	- Defects to be corrected
D	- No functioning - Deteriorated seriously
	- Need reconstruction or replacement entirely
	- Need urgent repairs entirely

1.2.4 Agricultural Survey

We have already indicated in the previous section the basic concept in terms of which this study has been undertaken.

The whole spectrum of functions and activities extending from land use to farm incomes had to be reviewed. They included various aspects of agriculture such as the cropping pattern, crops cultivated, diseases and pests afflicting paddy, factors affecting paddy yields, animal power and mechanization, use of fertilizer and other inputs, credit, marketing and processing prices of agricultural commodities etc. We also reviewed the data relating to agriculture which we had collected in Phase I.

Again, the agricultural survey involved a great deal of personal contact with both government officials and farmers. Agriculture and, in particular, paddy cultivation has been accorded top priority by Government. Consequently there are several governmental institutions concerned with agriculture in settlement schemes.

Firstly, there are the Colonization Officers and Field Instructors belonging to the Land Commissioner's Department. Then we have the staff of the Department of Agrarian Services such as the Divisional Officers and the Cultivation Officers who have a big role to play in agricultural production in settlement Schemes. The Agriculture Department too have their own staff in the field i.e. the Agricultural Officers and under their control the Range Agricultural Instructors and under them the K.V.S.S. (the agricultural extension workers) who in fact maintain contact with the farmers at the field level.

Most of these officers are, however, located at the Agrarian Services Centres, of which there are two in Stages I/II of the Minipe Scheme (Morayaya and Ulpothagama) and two in Minipe Stages III/IV (Hettipola and Handungamuwa) and one at Ridimaliyadda in the Nagadeepa Scheme. The team met with officials of the Departments concerned as well as with farmers and obtained useful information from them relating to the various aspects of agricultural production in the respective areas.

In-depth investigation into the several aspects of agriculture were conducted by the Team in the six Sample Areas in Minipe and the two Sample Areas in Nagadeepa: (see also para 3.1.2).

The team also visited, and obtained information and advice from the staff of, the three Kachcheries (Kandy, Matale and Badulla), the Offices of the Irrigation Department, the Co-operative Development Department, the Central Agricultural Research Station at Peradeniya, the Agricultural Research Station at Maha Illupalama, and the Centre Rice Breeding Station at Batalagoda. We also visited the Branches of the State Banks, the Co-operatives and the Regional, and local, offices of the Paddy Marketing Board and also the Range Veterinary Surgeons' offices.

As indicated, we considered the several aspects involved in agricultural development in the final analysis as the components of an integrated whole within the framework of the overall developmental plans of government for the whole island in relating to all aspects of economic development and not merely in relation to agricultural development in these two Areas alone.

1.2.5 Livestock Survey

The Team met with the field staff of the respective Kachcheries, the Department of Agrarian Services, the Department of Agriculture and the Department of Animal Production and Health. We also interviewed several farmers in both segments of the Minipe Scheme, (Stages I & II and Stages III & IV respectively), as well as in the Nagadeepa Scheme to obtain information at first hand both in relation to the present position relating to crop agriculture and livestock keeping and the interest the farmers themselves had in any future plans for livestock development in these two Schemes.

The team also met key officials of the Kachcheries and the Government institutions intimately connected with the promotion of livestock development in Sri Lanka. These institutions included the Department of Animal Production and Health, the National Livestock Development Board, the Mahaweli Authority of Sri Lanka's Livestock and Dairy Development Programmes and the Ministry of Rural Industrial Development.

We also obtained from these Governmental authorities the necessary data and had recourse to several studies on the subject of livestock development in Sri Lanka.

1.2.6 Road Survey

The condition of maintenance of all roads, (i.e. main roads, the canal operation and maintenance roads and the

village roads) was evaluated by traversing the roads by vehicle. In the case of sites where the roads were in a poor condition, road width and reservation area for the roads were investigated on foot. Highlands along the Mahaweli River were investigated to determine the feasibility of the construction of a new road and the connection of the proposed road with exisitng roads.

Mahaweli System C area was investigated to evaluate the usefulness of a new bridge across the Mahaweli River and select the location of the bridge. Only two roads, the Minipe Bund Road and the Hettipola-Matale road, link Stages III and IV with neighbouring areas. The condition of the Hettipola road was checked by traversing by vehicle. A new road is under construction as a part of the Integrated Rural Development Project (IRDP) in Stages III and IV. The route was verified on the ground.

A traffic survey was carried out to evaluate the traffic situation in the Minipe Scheme. Enumeration was made at four locations, i.e. Handaganawa in Stage I, Weragama at T junction, Hasalaka junction and Hettipola T junction because the number of roads which link the Scheme to the outside world is limited due to topographical conditions.

The enumeration was carried out at 11 points on the four locations from 06.00 hours through 19.00 hours on 25th July 1985 avoiding the Friday when there is market fair at Mahiyangana. Enumeration time was restricted up to 19.00 hours because preliminary survey showed that traffic would reduce quickly at nightfall due to the difficulty of negotiating the Hasalaka - Kandy road and the Hettipola - Matale road by night.

The survey was carried out in respect of government buses, private buses, trucks, cars and motorcycles. A survey sheet, as in Format at Table 1.2.3 was used to evaluate hour by hour fluctuation. The Enumerators were labourers selected two days in advance of the day of at the start of the survey

Table 1.2.3 TRAFFIC SURVEY FORM

Location ..... Route .....

Enumerator ..... Date .....

Time	Bus		Truck	Car	Motorbike	Bicycle
	Big	Mini				
6:00 - 7:00						
7:00 - 8:00						
8:00 - 9:00						
9:00 - 10:00						
10:00 - 11:00						
11:00 - 12:00						
12:00 - 13:00						
13:00 - 14:00						
14:00 - 15:00						
15:00 - 16:00						
16:00 - 17:00						
17:00 - 18:00						
18:00 - 19:00						

at each locations to monitor progress. The survey sheets were collected at the end of the same day.

1.2.7 Domestic Water Survey

The Minipe Scheme is located on a long and narrow strip of land along the Minipe main canal, 74.2 km. It was not possible to carry out a detailed survey in both Schemes, Minipe and Nagadeepa. A detailed field survey, however, was conducted in the sample areas selected for the irrigation agricultural, and socio-economic, surveys, to facilitate evaluation of those factors.

The study of procurement and use of water for domestic purposes was done by interview of villagers in the sample areas. At the same time, data on fluctuation of ground water levels were collected because the features likely to be most relevant include climate, topography and water discharge in the canals.

Improvement of public health is the strongest, and most frequently advanced, argument for expenditure on domestic water supply. Initially, a school was selected to obtain information on the condition of health of the children. Physical examination, however, could not be carried out in either Area due to lack of a doctor. Information on health conditions was also obtained by interviewing the staff and patients at four hospitals and a dispensary in the Minipe Scheme, and from a dispensary in the Nagadeepa Scheme.

Water quality was evaluated, samples taken from the Minipe main canal and from wells existing in the sample areas being used for the purpose. The water samples were taken at several points along the Minipe main canal to evaluate the effect of water travel through the Canal on 10th July, 1985. Fluctuations of quality in one day were measured at the Anicut at Hasalaka and at the 72 km point of the main canal. Existing water distribution system was investigated in the Minipe Scheme. Information was also collected on administration, water quality control method and amount of supply.

ANNEX 2 CLIMATE CONDITIONS AND WATER RESOURCES

2. CLIMATE CONDITIONS AND WATER RESOURCES

2.1 CLIMATE CONDITIONS

Meteorological data, collected during the study, are shown in Table 2.1.1 through Table 2.1.14.

Table 2.1.1 MONTHLY MEAN MAXIMUM TEMPERATURE AT GIRANDRUKOTTE

Unit : Centigrade

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Mean
1976	-	-	-	34.1	36.9	38.0	36.6	36.4	37.3	35.0	32.0	29.6	-
1977	30.2	30.7	32.5	35.6	34.5	36.2	37.4	37.1	37.2	33.7	33.8	30.6	34.1
1978	31.4	32.2	33.0	35.2	35.5	35.3	34.8	35.4	34.9	32.5	30.4	28.1	33.2
1979	29.9	31.4	33.1	36.0	35.2	36.4	35.2	35.4	31.8	31.9	30.1	28.1	32.9
1980	29.1	32.1	33.9	33.2	35.8	36.1	36.2	36.7	37.3	33.3	31.7	30.8	33.8
1981	31.0	31.1	33.6	35.2	36.0	33.4	35.7	35.7	32.6	32.0	31.3	30.1	33.1
1982	30.1	33.3	34.9	35.4	35.5	36.7	36.7	35.8	36.6	32.4	30.0	28.5	33.8
1983	29.6	33.3	36.2	37.6	37.3	37.8	37.4	37.1	35.2	34.6	31.9	29.2	34.8
1984	29.2	29.4	32.3	33.0	35.5	35.8	-	-	34.4	33.7	30.4	29.5	-
1985	28.8	30.0	32.6	33.8	34.9	33.5							-
Mean	29.9	31.5	33.6	34.9	35.7	35.9	36.3	36.2	35.3	33.2	31.3	29.4	33.6

Table 2.1.2 MONTHLY MEAN MINIMUM TEMPERATURE AT GIRANDRUKOTTE

Unit : Centigrade

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Mean
1976	-	-	-	21.8	23.9	23.7	22.1	21.4	21.2	19.6	22.7	20.5	-
1977	22.5	23.0	22.4	22.9	21.8	19.7	18.3	24.1	23.3	21.7	22.0	20.5	21.9
1978	21.5	19.9	21.8	24.3	24.6	23.3	20.9	23.8	22.1	22.2	21.5	21.0	22.2
1979	21.0	20.9	20.6	21.0	21.1	21.3	21.6	22.6	22.2	21.5	21.1	20.7	21.3
1980	19.3	18.8	18.9	21.1	20.9	19.4	20.7	22.2	23.3	23.1	22.4	21.4	21.0
1981	20.1	18.5	21.3	21.6	23.6	24.0	22.7	23.1	22.9	22.8	22.2	21.4	22.0
1982	20.5	19.6	21.9	22.7	23.0	24.3	-	-	-	-	-	-	-
1983	-	22.6	22.5	24.2	24.8	25.7	25.1	24.9	23.8	23.4	22.3	21.0	-
1984	-	22.7	22.3	23.5	24.2	24.8	-	-	22.1	21.9	22.5	21.9	-
1985	21.9	21.9	23.3	23.5	24.1	23.8							-
Mean	21.0	20.9	21.7	22.7	23.2	23.0	21.6	23.2	22.6	22.0	22.1	21.1	22.1

Table 2.1.3 MONTHLY MEAN RELATIVE HUMIDITY AT GIRANDRUKOTTE

Unit : Percent

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Mean
1976	-	-	-	74	-	-	63	58	56	67	80	84	-
1977	73	82	77	73	73	58	61	63	59	79	80	86	72
1978	80	80	78	69	70	60	57	53	54	70	76	85	69
1979	78	77	70	66	63	60	55	52	71	76	83	86	70
1980	79	66	65	73	67	55	50	50	55	70	78	75	65
1981	74	73	70	71	72	59	65	63	76	79	83	86	73
1982	79	70	72	75	78	62	57	58	60	90	90	89	73
1983	85	77	70	71	70	59	58	58	62	74	78	91	71
1984	90	91	81	83	75	63	-	-	73	73	87	80	-
1985	87	84	81	78	72	64							-
Mean	81	78	74	73	71	60	58	57	63	75	82	85	71

Table 2.1.4 MONTHLY MEAN EVAPORATION AT GIRANDRUKOTTE

Unit : mm/day

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Mean
1976	-	-	-	3.9	5.0	6.4	6.5	4.6	6.3	4.9	4.8	3.3	-
1977	3.3	3.2	3.3	3.8	3.2	5.7	4.7	5.6	6.3	2.8	4.0	2.1	4.00
1978	3.3	3.8	4.7	5.2	4.7	6.4	6.2	7.5	6.4	4.9	4.2	2.7	5.00
1979	3.4	4.3	4.7	5.1	5.5	7.8	7.6	7.7	3.4	3.4	3.2	3.9	5.00
1980	3.8	4.8	5.5	4.8	5.1	6.1	8.3	6.5	6.6	4.4	1.6	0.6	4.84
1981	3.0	3.9	5.1	4.7	5.7	5.9	6.0	6.5	4.6	6.0	-	4.2	-
1982	3.3	5.3	5.6	5.5	4.1	6.8	7.5	6.8	6.8	5.1	3.2	3.1	5.26
1983	2.8	3.8	5.6	5.8	3.8	4.0	4.1	3.7	3.7	3.5	2.9	3.7	3.95
1984	3.8	3.0	2.8	2.5	2.7	4.0	-	-	3.9	2.9	2.9	2.1	-
1985	3.1	2.4	2.3	2.9	2.7	2.8							-
Mean	3.3	3.8	4.4	4.4	4.3	5.6	6.4	6.1	5.3	4.2	3.4	2.9	4.51

Table 2.1.5 MONTHLY MEAN SUNSHINE HOURS AT GIRANDRUKOTTE

Unit : hrs/day

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Mean
1976	-	-	-	7.9	8.9	8.3	7.4	6.7	7.6	6.0	4.2	3.4	-
1977	6.3	4.9	5.7	7.0	6.1	7.1	4.0	6.9	6.0	4.4	4.3	2.5	5.4
1978	4.5	5.9	6.7	7.0	6.5	6.0	6.4	6.2	6.3	6.4	5.8	3.6	5.9
1979	5.0	6.8	8.0	8.3	8.2	8.0	7.9	7.8	6.0	6.8	3.5	2.4	6.6
1980	4.9	7.6	8.3	6.1	7.3	6.6	6.8	6.1	7.1	5.9	4.7	4.0	6.3
1981	6.4	7.2	7.6	6.4	-	-	-	6.1	9.0	5.0	5.6	4.1	-
1982	4.9	8.2	6.6	7.3	5.9	5.5	6.5	6.6	6.2	5.3	3.1	2.9	5.8
1983	4.8	9.1	8.8	7.8	8.0	7.6	6.9	5.9	6.6	7.3	5.2	1.5	6.6
1984	2.0	2.9	6.8	4.9	8.7	6.7	-	-	6.0	6.8	2.8	3.9	-
1985	4.2	5.2	7.2	8.2	6.6	5.7							-
Mean	4.8	6.4	7.3	7.1	7.4	6.8	6.6	6.5	6.8	6.0	4.4	3.1	6.1

Table 2.1.6 MONTHLY MEAN WIND VELOCITY AT GIRANDRUKOTTE

Unit : km/hr

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Mean
1976	-	-	-	2.08	2.54	3.15	4.99	-	3.29	4.10	2.68	2.34	-
1977	2.19	2.11	1.99	2.01	2.18	4.01	4.17	4.10	4.38	2.02	1.97	2.23	2.78
1978	2.02	2.27	2.17	2.44	2.77	5.30	5.28	5.40	4.21	2.66	3.45	2.24	3.35
1979	2.17	2.19	2.23	2.35	2.83	6.34	5.72	5.42	3.36	2.81	2.43	2.41	3.36
1980	3.34	2.91	2.68	2.40	2.19	4.03	5.97	4.34	3.52	2.76	2.33	2.25	3.23
1981	2.26	2.18	2.70	2.84	1.68	5.82	4.73	5.47	3.30	3.36	3.66	2.87	3.41
1982	2.68	3.33	3.42	3.35	3.25	5.21	6.09	5.50	5.82	2.88	3.02	3.69	4.02
1983	3.03	3.13	3.85	4.46	3.99	3.94	5.24	5.28	5.20	4.92	3.90	3.43	4.20
1984	3.78	2.87	2.40	2.16	2.33	4.06	-	-	2.53	2.39	2.26	2.26	-
1985	1.91	1.68	1.88	1.63	2.44	3.24							-
Mean	2.60	2.52	2.59	2.57	2.62	4.51	5.27	5.07	3.96	3.10	2.86	2.64	3.36

Table 2.1.7 MONTHLY RAINFALL AT GIRANDRUKOTTE

Unit : mm

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1976	——	——	——	124.5	21.6	0.0	91.4	81.7	9.0	58.5	193.4	365.6	**********
1977	61.7	118.4	167.1	150.7	70.7	4.7	49.0	12.4	260.3	349.6	505.1	513.2	2262.9
1978	155.5	173.8	117.2	214.7	79.8	1.2	26.0	0.0	51.0	318.7	296.1	649.1	2083.1
1979	201.7	80.8	147.5	115.7	36.2	7.0	89.5	56.0	205.4	476.5	424.7	411.6	2252.6
1980	76.8	0.0	101.2	241.7	40.2	36.5	0.0	43.0	48.6	263.7	501.3	145.6	1498.6
1981	154.0	276.1	68.3	75.0	193.4	1.4	166.0	39.6	105.6	82.9	194.3	302.5	1659.1
1982	11.9	0.0	125.5	52.9	113.1	3.0	17.5	66.0	70.5	257.4	561.8	606.1	1885.7
1983	112.0	0.0	0.0	17.5	39.5	11.7	85.7	0.0	86.5	387.5	171.2	760.4	1672.0
1984	637.7	592.5	566.8	104.0	23.7	0.0	156.8	51.8	298.1	101.7	331.5	122.9	2987.5
1985	331.2	160.5	88.5	100.2	109.8	16.4							**********
MEAN	193.6	155.8	153.6	119.7	72.8	8.2	75.8	38.9	126.1	255.2	353.3	430.8	2037.7

Table 2.1.8 MONTHLY RAINFALL AT ARAWA

Unit : mm

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1925	——	——	——	——	——	——	——	——	——	——	——	256.3	**********
1926	327.1	31.7	87.4	50.8	236.5	0.0	0.0	60.4	19.6	119.9	321.6	463.5	1718.5
1927	1060.2	173.5	534.9	42.9	76.7	18.5	12.4	75.7	88.1	120.4	631.7	590.8	3425.8
1928	514.1	84.3	53.6	266.9	96.8	0.0	77.0	0.0	8.1	249.9	467.3	344.4	2162.4
1929	17.8	100.6	174.7	220.5	144.3	9.9	0.0	15.2	269.2	36.1	348.5	518.1	1854.9
1930	520.2	56.4	123.4	176.8	201.7	53.8	0.0	59.2	57.9	409.9	375.7	172.0	2207.0
1931	702.8	153.2	16.5	207.0	36.6	0.0	0.0	29.7	123.7	127.2	631.9	699.0	2727.6
1932	208.5	121.2	169.7	11.4	51.6	45.2	0.0	346.7	31.7	279.4	217.7	273.0	1756.1
1933	1364.9	124.5	54.9	51.3	184.7	0.0	41.9	106.2	26.4	196.3	251.7	83.6	2486.4
1934	244.1	152.9	79.5	125.0	54.4	15.5	0.0	0.0	3.8	278.6	232.7	614.7	1801.2
1935	408.2	105.9	122.2	105.4	43.9	37.3	0.0	49.5	22.9	181.6	336.5	626.1	2039.5
1936	210.0	43.2	171.4	21.6	76.2	27.2	4.3	42.4	125.5	266.2	240.0	829.3	2057.3
1937	632.4	209.3	98.5	109.5	7.4	0.0	9.7	89.9	93.0	86.1	337.6	69.3	1742.7
1938	432.8	309.1	129.5	144.5	23.9	0.0	153.2	58.2	139.9	69.8	221.7	622.0	2304.6
1939	235.4	102.1	55.4	375.4	66.5	11.2	3.3	90.4	50.5	203.7	250.4	477.8	1922.1
1940	71.1	213.1	5.6	146.0	224.0	4.8	0.0	0.0	92.5	197.9	278.1	568.4	1801.5
1941	608.1	346.4	450.0	260.1	40.6	4.1	5.3	12.7	76.7	329.7	385.3	218.9	2737.9
1942	369.0	225.0	123.9	110.2	40.9	3.8	12.7	52.3	84.6	167.9	191.5	580.1	1961.9
1943	145.8	374.6	27.7	119.1	77.0	0.0	17.0	5.1	81.0	148.8	284.2	545.6	1825.9
1944	205.5	554.5	103.6	147.3	109.0	13.5	1.3	117.3	115.1	162.3	513.6	317.7	2360.9
1945	116.6	4.6	240.3	83.3	38.9	9.9	102.6	12.7	0.0	231.6	436.4	172.5	1449.4
1946	281.4	348.0	250.2	168.9	29.7	1.0	4.8	46.2	84.0	198.6	328.9	623.3	2365.0
1947	527.8	46.0	201.7	198.1	78.0	12.7	58.7	97.8	0.0	182.9	109.7	398.3	1911.7
1948	307.1	19.0	145.5	151.4	15.2	0.0	51.8	22.9	66.0	261.6	245.9	678.7	1965.1
1949	430.3	160.5	122.9	159.8	5.6	0.0	29.5	202.2	18.3	140.5	580.6	809.0	2659.2
1950	366.3	125.2	226.6	59.2	114.0	0.0	11.7	48.8	45.0	186.4	54.4	201.4	1439.0
1951	1041.1	316.5	204.7	163.8	105.9	15.0	4.3	67.6	135.4	169.4	388.6	695.4	3307.7
1952	684.8	122.7	111.0	140.7	127.0	3.8	45.5	0.0	120.6	112.3	277.4	353.0	2098.8
1953	497.1	216.1	163.3	71.6	0.0	0.0	95.8	57.1	66.5	242.8	142.0	614.7	2167.0
1954	407.7	243.8	114.0	143.5	41.9	0.0	0.0	0.0	49.5	27.9	225.8	364.0	2209.9
1955	857.0	563.6	175.8	104.4	8.4	8.9	27.7	173.0	228.6	49.5	185.2	261.9	2644.0
1956	210.8	76.2	59.9	111.8	0.0	251.5	3.0	29.2	3.3	168.1	671.5	505.2	2090.5
1957	384.3	376.7	29.7	66.5	59.2	8.6	9.7	27.9	81.3	143.3	724.6	1418.8	3330.6
1958	425.7	132.8	404.4	178.0	74.7	10.4	3.6	56.6	47.8	128.3	278.6	650.0	2390.9
1959	338.8	268.0	30.5	246.4	141.2	37.8	37.8	9.7	53.8	361.7	430.0	386.3	2342.0
1960	531.6	807.9	30.2	296.4	76.5	0.0	130.0	2.5	101.3	187.2	184.7	201.7	2550.0
1961	372.3	316.5	222.2	262.1	19.0	10.2	0.0	2.0	143.0	201.9	653.5	658.9	2861.6
1962	469.6	153.7	303.0	132.8	81.8	0.0	0.0	106.2	2.5	208.3	230.6	457.9	2146.4
1963	676.4	295.4	67.3	131.1	95.8	16.5	17.8	——	152.1	283.7	504.7	703.8	**********
1964	628.9	588.0	205.2	27.2	47.0	0.0	102.6	0.0	97.5	150.1	239.3	427.7	2513.5
1965	184.4	419.1	98.3	238.0	143.8	0.0	0.0	159.5	34.5	229.6	523.2	548.1	2578.5
1966	443.5	113.8	213.1	231.4	0.0	0.0	24.4	78.5	62.0	326.4	230.4	364.2	2087.7
1967	424.2	353.8	109.7	29.0	27.9	28.4	0.0	0.0	112.5	206.2	643.4	347.7	2282.8
1968	185.0	36.8	300.7	29.5	42.9	33.0	3.6	0.0	50.8	216.4	372.3	524.2	1795.2
1969	429.0	202.7	10.4	175.3	23.4	0.0	55.4	152.6	41.4	190.2	104.9	683.2	2068.5
1970	415.3	357.6	——	——	——	——	——	——	——	——	——	——	**********
MEAN	442.6	225.5	150.5	143.0	72.5	15.7	26.3	60.8	74.7	196.2	350.5	492.2	2236.0

Table 2.1.9 MONTHLY RAINFALL AT HASALAKA

Unit : mm

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1981	128.0	216.0	84.0	36.0	44.0	0.0	105.0	0.0	0.0	28.0	0.0	331.0	972.0
1982	57.0	0.0	178.0	114.0	77.0	0.0	13.0	0.0	51.0	243.0	407.0	585.0	1725.0
1983	139.0	23.0	0.0	50.0	180.0	25.0	75.0	0.0	0.0	179.0	239.0	578.0	1488.0
1984	547.5	166.0	150.0	29.0	4.0	0.0	31.0	0.0	152.0	114.0	225.5	229.0	1648.0
1985	215.0	214.0	71.0	137.0	23.0	11.0	0.0						**********
MEAN	217.3	123.8	96.6	73.2	65.6	7.2	44.8	0.0	50.8	141.0	217.9	430.8	1458.3

Table 2.1.10 MONTHLY RAINFALL AT HEMBARAWA

Unit : mm

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1984	——	537.3	444.3	146.0	86.9	0.0	110.0	0.0	184.9	49.9	244.3	115.7	**********
1985	373.4	205.9	104.8	40.3	37.3	11.0	90.9						**********
MEAN	373.4	371.6	274.5	93.1	62.1	5.5	100.4	0.0	184.9	49.9	244.3	115.7	1875.4

Table 2.1.11 MONTHLY RAINFALL AT MINIPE

Unit : mm

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1936	——	——	145.8	337.8	40.9	21.6	3.3	5.6	77.2	224.8	93.2	847.6	**********
1937	——	——	80.0	99.8	9.1	——	15.0	135.6	79.2	129.3	237.2	196.8	**********
1938	470.4	358.1	187.7	198.4	33.8	6.6	102.9	28.4	113.5	87.1	118.4	584.2	2289.5
1939	151.9	68.8	65.5	368.3	57.7	27.4	4.1	120.1	86.9	230.1	340.9	374.1	1895.8
1940	52.6	348.5	31.0	135.6	263.4	23.9	4.8	0.0	50.5	115.3	157.2	471.7	1654.5
1941	612.6	388.1	79.2	154.9	81.3	0.0	0.0	1.0	80.0	279.6	295.9	348.7	2321.3
1942	375.7	97.3	95.0	193.3	36.8	0.0	2.3	45.7	58.4	343.9	263.6	576.6	2088.6
1943	234.9	320.5	20.3	244.3	168.4	0.0	0.0	0.0	81.8	93.5	255.0	923.8	2342.5
1944	398.3	667.0	281.9	232.9	11.2	0.0	0.0	47.2	110.5	387.8	556.2	399.0	3092.0
1945	43.4	0.0	——	——	47.5	46.5	68.3	14.2	17.8	325.9	364.5	219.0	**********
1946	249.2	561.3	261.4	262.4	82.8	0.0	0.0	8.9	96.5	233.7	414.0	703.3	2873.5
1947	894.8	39.1	192.3	243.3	53.1	0.0	58.9	143.0	0.0	136.6	150.4	334.8	2246.3
1948	453.9	68.1	207.3	287.0	18.0	0.0	143.0	0.0	33.5	176.0	278.4	715.2	2380.4
1949	452.9	185.4	112.5	199.4	0.0	0.0	19.3	141.2	63.5	82.0	318.8	466.6	2041.6
1950	296.7	206.0	72.6	0.0	48.3	0.0	0.0	12.2	14.0	139.2	30.2	243.3	1062.5
1951	1007.1	267.2	80.8	187.4	156.2	0.0	0.0	264.1	98.8	124.5	325.4	497.1	3008.6
1952	741.1	193.5	136.6	189.0	58.9	0.0	66.8	0.0	64.0	19.6	430.8	305.3	2205.6
1953	477.5	270.8	145.5	88.1	0.0	0.0	128.5	24.4	74.4	175.8	271.8	663.7	2320.5
1954	492.7	97.8	168.4	156.5	10.2	0.0	49.5	41.9	40.6	441.7	145.8	555.2	2200.3
1955	913.3	476.7	324.6	133.1	8.9	0.0	0.0	119.6	152.9	145.0	177.0	383.5	2834.6
1956	375.4	74.7	101.6	113.3	1.0	92.5	7.9	63.5	0.0	112.0	626.6	453.4	2021.9
1957	129.8	131.1	37.1	135.1	34.8	6.9	18.8	2.3	76.5	146.3	689.3	1248.6	2656.6
1958	414.0	201.4	231.6	228.1	60.4	3.3	8.9	8.9	58.9	137.9	252.5	514.8	2120.7
1959	299.5	113.5	7.6	151.4	73.9	17.8	5.6	15.0	16.5	440.2	286.5	401.6	1829.1
1960	544.8	774.2	13.7	208.3	83.3	0.0	221.7	66.5	16.5	162.3	303.3	195.3	2589.9
1961	356.6	210.8	179.1	107.4	——	——	——	0.0	59.7	181.1	579.9	835.6	**********
1962	290.3	318.2	171.4	190.0	146.8	0.0	63.5	195.1	0.0	233.7	287.3	649.2	2545.5
1963	460.7	420.4	74.7	158.2	45.0	3.8	25.1	0.0	169.4	191.0	545.8	813.5	2907.6
1964	814.5	785.6	189.2	127.5	94.0	0.0	81.3	31.0	62.0	157.2	286.8	234.9	2864.0
1965	410.4	660.6	37.8	461.2	296.7	0.0	43.7	150.4	0.0	128.0	666.2	586.2	3441.2
1966	502.6	——	276.3	177.5	9.7	0.0	0.0	10.4	69.8	400.3	358.1	591.0	**********
1967	——	——	——	——	——	——	——	——	——	——	——	——	**********
1968	——	16.5	——	——	——	——	——	——	——	——	——	——	**********
1969	191.5	520.7	185.7	75.7	51.1	0.0	0.0	122.9	0.0	385.6	91.7	748.3	2373.2
1970	755.6	691.9	0.0	29.7	61.0	0.0	0.0	0.0	43.4	75.9	495.8	602.5	2755.8
1971	535.7	53.8	0.0	143.5	28.2	2.5	64.5	0.0	131.3	428.2	242.6	——	**********
1972	101.6	62.0	8.4	42.4	17.5	0.0	0.0	869.2	753.6	622.3	867.6	——	**********
MEAN	439.5	292.4	123.6	178.3	64.4	7.7	35.5	76.8	81.5	219.8	337.3	535.9	2391.6

Table 2.1.12 MONTHLY RAINFALL AT HORABORAWEWA

Unit : mm

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1909	—	—	—	—	—	—	—	—	—	—	166.1	185.4	**********
1910	314.9	118.9	22.9	77.0	15.2	0.0	72.9	5.8	0.0	107.2	198.1	223.5	1156.4
1911	167.6	85.3	5.8	2.5	58.4	25.3	0.0	17.8	22.9	223.3	546.3	626.8	1782.0
1912	38.1	0.0	9.4	211.3	87.9	22.9	30.5	12.7	24.9	189.2	124.2	387.1	1138.2
1913	1116.5	147.6	31.7	125.7	61.0	6.1	0.0	0.0	21.7	296.7	186.7	446.3	2430.0
1914	313.9	63.5	82.5	61.5	38.1	0.0	0.0	10.2	138.4	217.2	250.7	626.6	1802.6
1915	384.8	63.6	241.3	106.7	33.0	12.7	10.2	82.5	47.0	212.6	102.9	308.9	1606.4
1916	109.2	44.4	91.4	44.4	36.8	0.0	90.2	88.9	134.9	125.5	347.2	208.3	1321.2
1917	614.7	396.2	292.1	66.0	121.9	0.0	86.4	193.0	77.5	198.1	530.6	305.3	2881.8
1918	414.0	12.7	99.1	46.0	48.8	0.0	98.5	2.5	24.1	352.5	175.8	402.6	1676.6
1919	202.9	30.5	83.8	99.1	106.7	2.5	43.4	0.0	35.8	322.6	304.3	319.3	1550.9
1920	172.2	138.7	48.3	205.7	74.9	55.9	0.0	0.0	8.9	227.6	371.8	295.1	1599.1
1921	555.5	0.0	20.3	148.6	0.0	76.2	22.9	200.4	78.7	346.2	287.0	386.1	2121.9
1922	160.5	152.4	12.7	94.0	12.7	0.0	0.0	0.0	0.0	671.5	214.1	99.1	1417.0
1923	506.2	0.0	101.6	45.7	48.3	8.9	—	—	36.8	186.9	57.7	627.4	**********
1924	300.7	81.8	120.0	39.1	73.7	0.0	0.0	0.0	21.6	226.3	213.9	887.7	1964.8
1925	374.9	132.1	406.9	133.6	77.0	5.1	7.6	5.1	0.0	315.2	392.7	502.9	2353.1
1926	325.4	30.0	40.1	106.7	210.6	0.0	7.6	39.6	123.4	223.6	395.0	448.3	1950.5
1927	375.1	211.6	323.6	120.1	113.0	6.3	29.2	79.5	94.7	98.3	256.0	276.3	1983.9
1928	369.0	84.3	41.9	249.7	10.7	0.0	162.6	2.5	75.9	149.3	605.0	245.1	1996.0
1929	94.5	72.6	162.6	301.0	165.9	0.0	0.0	35.6	145.8	63.5	239.0	562.6	1843.1
1930	370.3	159.0	47.2	91.2	80.3	19.8	0.0	35.3	27.2	332.5	195.3	64.3	1422.4
1931	378.4	74.7	28.7	237.7	72.1	7.1	0.0	8.6	29.7	157.7	427.2	463.0	1684.9
1932	100.3	127.8	151.6	80.8	40.1	11.4	0.0	51.8	7.1	175.5	172.5	108.5	1027.4
1933	874.7	48.8	64.5	93.9	187.4	0.0	63.5	105.4	50.3	44.4	373.1	130.8	2036.8
1934	337.0	209.5	174.5	176.8	55.9	44.4	0.0	0.0	25.4	192.0	194.3	348.5	1753.3
1935	320.5	146.0	137.4	64.3	33.5	18.5	0.0	63.5	109.5	169.7	389.9	788.4	2241.2
1936	430.0	288.0	300.7	100.1	70.1	0.0	0.0	41.7	90.2	52.1	225.0	537.4	2135.3
1937	561.3	361.7	51.8	54.4	18.0	0.0	0.0	145.5	47.8	163.6	216.9	111.0	1732.0
1938	438.9	334.5	265.9	261.4	86.6	0.0	122.7	46.2	219.2	187.2	143.3	556.5	2662.4
1939	181.3	50.5	135.9	365.7	56.4	31.7	0.0	0.0	43.7	111.5	238.2	410.4	1625.3
1940	77.5	460.7	44.4	286.0	250.9	12.4	0.0	0.0	132.1	216.9	404.4	493.5	2378.8
1941	520.7	322.6	48.5	236.2	74.4	0.0	15.7	6.6	163.3	470.1	289.8	236.0	2383.9
1942	391.1	133.9	149.3	197.9	17.0	6.1	4.6	32.5	244.8	222.2	245.4	810.0	2454.8
1943	135.4	259.1	149.3	74.2	225.3	0.0	0.0	0.0	19.3	127.8	211.8	507.2	1709.4
1944	325.6	565.4	233.2	133.9	232.7	0.0	0.0	116.3	106.2	479.8	407.4	271.5	2872.0
1945	28.4	3.8	262.6	104.6	9.4	13.5	46.7	0.0	0.0	314.7	525.3	149.6	1458.6
1946	174.0	363.7	254.0	286.2	40.6	0.0	0.0	53.3	66.0	296.4	462.8	582.1	2579.1
1947	797.8	38.4	121.9	256.5	47.2	0.0	27.9	123.2	0.0	201.9	204.2	359.6	2178.6
1948	250.9	15.2	141.0	149.1	41.9	0.0	221.0	0.0	0.0	291.6	297.4	625.3	2033.4
1949	294.1	122.4	14.5	154.4	10.2	0.0	42.2	133.1	43.2	275.8	682.5	565.6	2338.0
1950	234.9	110.5	92.7	37.6	90.7	0.0	7.6	26.7	38.1	141.0	207.8	253.5	1241.1
1951	1051.0	109.2	66.5	75.4	30.5	0.0	32.0	129.5	108.2	193.5	514.3	581.4	2891.5
1952	666.0	87.6	34.0	268.5	130.8	0.0	76.7	19.0	164.1	126.2	321.0	246.4	2140.3
1953	423.4	241.3	124.5	191.0	0.0	31.2	57.1	47.0	63.2	200.7	264.1	544.6	2188.1
1954	346.7	374.6	177.8	147.3	50.8	0.0	10.2	41.1	0.0	342.6	262.9	603.2	2357.2
1955	870.7	344.9	209.3	179.3	12.7	0.0	0.0	69.3	110.2	69.8	172.5	284.0	2322.7
1956	288.5	81.0	106.9	121.9	0.0	82.8	0.0	19.3	0.0	190.2	651.5	456.4	1998.5
1957	376.2	281.2	16.5	33.5	33.0	6.3	32.8	8.6	88.6	301.7	1144.5	796.5	3119.4
1958	415.5	152.4	210.6	199.9	43.2	5.8	8.4	45.2	45.5	55.6	345.2	503.4	2030.7
1959	244.8	84.1	55.6	205.5	220.7	24.9	3.3	71.1	97.0	414.0	447.3	683.2	2551.5
1960	568.9	843.0	22.6	259.3	143.8	0.0	151.4	25.4	13.7	247.4	362.4	173.5	2811.4
1961	515.9	195.1	144.3	343.1	54.6	6.3	14.2	5.3	52.8	197.9	603.7	560.8	2694.0
1962	393.9	174.2	177.8	244.3	174.5	4.3	10.9	339.0	46.5	163.3	275.3	338.3	2342.3
1963	455.4	319.8	113.5	158.7	61.2	0.0	42.4	2.3	184.4	238.5	494.8	641.3	2712.3
1964	509.2	419.3	159.0	70.4	79.2	3.8	112.8	104.4	37.3	110.2	185.2	411.5	2202.3
1965	208.5	513.8	103.4	231.4	65.0	10.2	1.5	229.9	0.0	305.8	454.9	412.2	2536.6
1966	358.1	96.5	255.3	81.0	44.2	12.2	3.3	84.1	111.5	323.6	356.9	307.6	2034.3
1967	275.6	299.2	130.0	54.6	11.2	49.8	2.8	4.1	54.6	251.5	749.0	379.0	2261.4
1968	287.5	18.0	290.3	88.1	8.6	6.1	10.9	0.0	26.7	222.5	200.1	342.6	1501.4
1969	362.7	189.2	35.8	253.2	43.9	0.0	4.6	182.1	120.6	365.5	119.4	704.6	2381.6
1970	354.6	532.9	105.2	143.0	85.1	4.3	2.5	21.1	64.3	40.1	288.3	290.0	1932.2
1971	357.6	—	—	—	—	—	—	—	—	—	—	—	**********
1972	—	—	72.6	—	—	16.5	38.1	—	—	—	427.7	507.5	**********
1973	134.1	448.8	75.2	69.1	38.6	58.4	59.9	10.7	95.2	183.4	530.3	621.3	2325.2
1974	3.0	139.4	37.8	176.5	109.5	6.1	38.6	26.9	46.2	52.3	85.3	522.2	1243.8
1975	225.0	161.0	135.1	104.6	130.0	11.9	147.6	49.5	116.1	67.1	194.8	317.0	1659.7
1976	326.9	53.3	57.7	117.1	39.9	54.6	56.4	75.4	30.5	78.5	310.4	224.5	1425.2
1977	60.4	66.3	181.6	67.3	84.1	4.1	107.9	29.7	173.0	255.8	280.7	290.6	1601.5
1978	130.3	79.8	72.4	101.8	43.7	0.0	22.1	5.1	14.0	237.2	189.2	565.1	1460.7
1979	162.8	82.3	118.1	65.5	9.4	18.5	22.4	0.0	70.4	308.6	384.0	319.3	1561.3
1980	53.3	0.0	53.3	285.2	44.2	0.0	0.0	14.0	4.3	253.5	336.5	89.7	1134.0
1981	135.1	—	107.2	76.5	127.2	0.0	119.6	2.5	17.8	171.2	—	317.0	**********
1982	22.6	0.0	95.0	214.6	101.6	10.8	48.5	28.4	49.7	288.3	302.8	489.8	1652.1
1983	236.7	3.0	0.0	36.6	75.4	11.7	89.4	2.5	19.3	262.6	264.7	708.9	1710.8
1984	433.3	337.8	402.6	171.7	31.7	4.3	98.0	—	—	—	—	—	**********
MEAN	343.1	177.6	122.4	144.7	72.1	11.2	36.2	48.7	63.8	220.8	328.8	418.6	1993.0

Table 2.1.13 MONTHLY RAINFALL AT KOBONELLA

Unit : mm

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1882	492.0	171.7	129.0	135.9	125.2	233.9	642.6	400.1	96.5	497.3	456.9	783.3	4165.2
1883	730.5	286.5	99.0	185.5	281.9	123.2	303.3	267.7	36.6	418.3	412.5	392.9	3635.1
1884	282.2	35.1	158.0	157.0	144.3	117.9	80.3	153.7	126.2	497.5	400.3	826.3	3179.6
1885	465.6	191.8	134.4	193.3	193.0	428.0	158.5	40.2	220.7	408.2	539.0	751.8	3744.7
1886	428.1	184.9	169.7	195.1	309.6	156.2	269.7	476.8	354.8	454.7	189.5	542.8	3933.9
1887	395.7	267.5	80.0	349.3	50.8	159.0	115.1	73.4	143.0	436.1	514.4	1737.3	4301.4
1888	51.3	9.4	91.4	159.5	422.1	427.7	44.2	62.0	137.2	824.5	343.9	804.2	2858.4
1889	422.6	99.3	351.8	273.0	417.1	115.8	71.1	201.7	420.9	253.5	361.9	578.8	3567.5
1890	923.2	169.2	99.1	225.8	62.8	132.4	92.2	95.6	146.6	192.5	422.5	335.6	2722.3
1891	226.8	254.0	428.5	146.8	420.4	133.9	77.0	72.6	100.1	797.0	119.6	816.8	3595.5
1892	1140.7	504.9	98.3	253.2	81.3	119.4	252.5	216.4	149.9	451.2	674.1	367.5	4509.4
1893	332.5	84.3	315.7	216.7	134.6	301.7	238.8	52.6	66.3	971.2	618.2	446.8	3379.4
1894	352.8	153.4	806.5	213.6	91.9	113.0	84.3	148.1	61.3	319.3	467.1	919.4	3172.7
1895	676.8	172.5	127.0	369.8	41.7	206.0	114.8	184.9	115.1	676.4	295.4	950.7	3732.8
1896	816.4	203.4	186.4	321.0	99.6	362.7	200.7	153.2	189.0	570.0	487.9	1360.9	4651.2
1897	842.6	120.1	403.6	508.0	137.2	329.9	159.8	340.1	212.1	486.1	803.7	699.7	4344.9
1898	569.4	89.9	113.5	266.4	159.8	211.1	107.4	54.9	230.6	539.2	413.7	766.8	3522.7
1899	1123.9	67.1	203.2	1031.5	274.3	212.6	170.9	184.6	227.1	955.0	609.6	641.8	5621.6
1900	502.1	105.2	42.4	225.3	100.1	225.0	323.8	202.4	217.7	674.9	921.6	692.1	4232.5
1901	419.8	326.4	270.0	726.7	206.5	343.1	167.8	149.9	128.3	412.7	623.5	581.6	4536.5
1902	420.4	342.0	234.2	275.1	103.9	18.3	155.4	75.7	322.1	555.7	924.5	480.3	4107.6
1903	931.1	649.7	14.0	234.9	271.3	140.2	200.4	92.5	365.2	555.7	168.6	412.2	4115.8
1904	892.5	189.2	158.7	40.9	136.1	446.3	212.6	86.9	346.4	486.9	370.1	662.0	4198.6
1905	327.9	111.5	101.3	222.7	306.8	277.4	135.6	24.1	232.5	210.3	601.7	449.3	2999.1
1906	280.4	40.9	187.4	86.4	58.2	196.3	300.2	151.9	116.1	761.7	482.6	401.6	3142.2
1907	207.5	110.2	466.2	257.0	65.8	263.1	310.4	199.4	101.6	525.3	456.7	214.4	3171.6
1908	593.3	204.2	242.6	155.4	140.5	153.2	128.0	85.8	319.0	323.6	250.7	984.2	3580.5
1909	345.6	245.4	266.4	215.4	93.7	152.1	292.6	252.0	189.0	409.2	330.4	380.7	3172.3
1910	433.6	199.9	70.6	165.3	54.1	161.8	265.2	321.0	109.0	406.1	644.9	1001.2	3832.4
1911	588.2	159.5	121.2	14.7	29.5	266.7	116.6	141.5	169.7	718.3	741.1	1337.8	4404.8
1912	180.6	106.7	82.0	193.6	110.2	104.4	206.0	118.1	125.8	382.8	476.7	956.0	3043.1
1913	2078.9	424.9	79.0	281.2	130.3	181.3	83.3	129.3	24.6	670.9	313.7	901.4	5306.8
1914	546.1	110.0	180.8	111.2	53.3	146.9	117.6	128.0	233.7	636.2	502.1	775.4	3542.4
1915	735.6	1364.0	346.2	108.5	78.7	91.9	333.0	203.4	205.7	310.2	405.1	530.6	4880.9
1916	146.1	63.2	221.5	286.1	158.5	252.0	280.4	254.8	225.5	223.0	522.2	255.8	2893.2
1917	1077.4	590.0	358.6	132.3	89.2	232.9	176.0	196.8	297.7	383.0	414.8	270.0	4220.7
1918	626.6	36.8	297.7	249.2	345.9	137.7	52.6	164.3	61.9	493.0	447.8	716.3	3609.8
1919	298.6	53.3	164.3	98.5	269.2	197.9	216.7	44.2	275.6	387.1	505.2	588.5	3093.1
1920	282.9	103.9	133.3	342.4	206.8	361.7	150.9	49.8	104.9	358.4	672.3	478.8	3268.1
1921	891.0	4.1	166.9	330.9	9.9	87.1	227.3	255.3	130.6	606.0	503.2	866.1	4078.4
1922	295.4	193.8	72.6	310.1	45.7	149.1	184.9	75.7	94.7	835.1	264.9	417.6	2939.6
1923	857.7	15.2	166.1	124.2	16.0	366.8	202.7	186.9	280.6	700.9	410.6	1204.4	4539.7
1924	462.3	389.9	426.7	67.1	106.7	122.4	206.7	177.8	239.5	399.0	220.8	480.8	3307.7
1925	627.9	221.8	436.9	246.9	154.2	62.8	36.1	124.7	93.0	527.8	628.4	594.8	3753.7
1926	336.1	17.3	251.5	239.9	284.7	29.5	302.1	70.1	70.6	166.4	268.0	393.2	2251.5
1927	767.6	205.2	380.2	167.4	141.5	130.6	111.2	95.8	185.7	195.8	410.4	378.9	3164.5
1928	393.2	158.0	115.3	433.3	81.3	54.9	123.4	79.2	9.9	284.7	403.3	389.9	2526.4
1929	163.6	136.1	212.3	319.3	195.8	62.2	98.5	27.2	189.5	109.2	365.5	502.1	2381.3
1930	376.2	122.7	84.9	198.1	239.3	186.7	27.7	49.0	89.4	523.7	440.5	59.4	2339.6
1931	633.5	178.6	80.9	436.1	58.4	125.2	15.7	149.6	91.9	221.0	564.1	614.7	3166.6
1932	365.3	223.3	163.3	295.6	301.5	136.9	126.0	105.9	125.2	505.9	479.5	355.6	2982.0
1933	1603.4	200.3	198.4	284.0	854.7	130.0	231.6	183.1	192.3	348.2	566.4	303.0	5103.4
1934	735.8	270.0	373.1	213.3	189.7	232.4	98.0	20.1	5.1	392.9	309.1	604.5	3444.0
1935	452.1	187.2	129.5	218.4	36.3	76.7	142.7	111.2	169.2	325.9	648.4	802.6	3300.2
1936	396.7	237.7	341.9	25.1	430.5	71.4	136.9	37.3	399.8	369.6	345.2	901.9	3694.0
1937	897.1	296.9	181.1	175.3	100.3	73.9	191.5	256.5	220.5	240.5	361.2	214.4	3209.2
1938	579.6	511.5	403.1	626.6	85.6	222.5	178.6	43.9	327.4	226.8	164.1	814.0	4183.7
1939	261.9	93.2	82.5	702.0	100.8	114.8	129.0	293.9	123.7	471.7	599.2	653.0	3625.7
1940	173.0	473.2	52.3	306.6	524.0	150.1	57.7	92.2	328.4	339.3	346.7	593.6	3517.1
1941	582.7	366.1	273.0	285.5	391.4	140.7	106.8	170.9	271.3	655.0	523.2	389.1	4175.3
1942	561.6	236.1	302.0	307.6	73.7	159.5	237.0	237.2	214.9	327.9	354.8	757.1	3769.4
1943	310.1	307.1	111.0	237.0	512.6	232.9	186.2	100.3	196.1	432.5	314.4	674.6	3616.8
1944	491.0	636.5	353.3	280.9	250.4	111.0	78.7	41.9	186.2	515.6	657.6	482.1	4085.2
1945	39.4	36.6	467.6	249.7	57.1	270.2	109.5	118.4	26.9	616.9	815.1	334.0	3141.4
1946	369.8	357.4	474.5	490.5	67.3	121.9	199.6	237.2	253.2	352.0	559.5	912.8	4305.7
1947	1802.5	75.9	399.3	379.5	136.6	90.4	92.8	371.1	88.1	372.3	308.1	634.5	3911.1
1948	482.6	54.4	196.6	324.6	193.0	143.5	222.2	68.3	17.3	265.9	442.2	857.0	3267.6
1949	430.3	122.7	91.2	461.5	113.8	103.6	246.1	224.3	98.3	140.5	554.7	858.2	3445.2
1950	652.6	229.1	176.0	112.0	297.7	85.8	96.5	72.6	282.9	157.7	258.6	307.3	2528.8
1951	1236.2	202.7	388.2	225.5	135.6	274.3	93.7	76.7	437.6	321.0	530.8	696.7	4419.0
1952	759.7	355.3	206.7	368.0	459.2	75.7	54.1	88.6	172.5	169.7	234.9	310.9	3255.3
1953	411.2	194.3	109.2	326.4	1.5	77.0	298.7	76.5	83.8	468.6	325.1	498.8	2873.1
1954	394.2	363.0	513.3	285.2	110.2	23.9	61.7	255.0	14.2	365.7	268.7	754.9	3410.0
1955	863.3	382.0	277.9	268.0	177.0	201.7	71.9	83.3	131.3	377.8	308.1	333.7	3276.0
1956	269.2	95.8	342.5	118.1	59.9	328.4	30.2	107.4	28.2	268.2	944.6	541.5	2934.0
1957	489.7	571.7	129.5	186.2	178.0	150.2	191.3	44.7	59.9	177.0	947.9	1881.0	5015.1
1958	655.5	146.8	239.5	293.4	304.6	56.6	27.9	369.6	142.7	446.3	529.1	567.9	3579.9
1959	358.1	110.0	71.1	243.3	122.9	226.8	321.0	174.7	226.1	531.1	567.7	622.8	3575.6
1960	715.0	1063.3	75.2	473.2	138.4	83.1	257.8	89.7	211.1	347.2	378.4	329.2	4181.6
1961	450.1	222.0	214.4	296.2	220.5	77.7	123.9	156.5	94.2	385.8	781.3	807.9	3830.5
1962	485.1	328.4	201.9	586.0	494.3	30.7	161.0	253.5	299.7	411.2	589.0	557.8	4398.6
1963	638.5	541.3	198.4	461.8	151.9	160.5	213.6	84.6	238.2	454.6	593.8	808.7	4545.9
1964	773.9	592.8	274.6	149.3	175.8	74.7	196.1	90.4	202.9	242.8	306.6	578.6	3658.5
1965	408.2	624.1	153.7	495.5	225.3	61.7	70.6	347.2	43.9	505.7	605.3	511.0	4952.2
1966	467.3	122.4	277.1	388.1	5.3	109.7	40.4	169.9	397.0	482.8	583.9	408.7	3452.6
1967	295.1	394.4	154.4	402.8	43.9	152.1	95.0	68.6	122.9	404.6	962.1	408.1	3704.0
1968	444.7	312.4	473.7	163.6	137.7	184.7	261.6	146.8	241.0	369.9	325.4	528.6	3589.2
1969	479.0	295.1	76.7	397.7	193.8	114.5	49.3	185.4	217.7	653.3	295.4	960.1	3918.0
1970	461.7	886.2	113.8	484.6	97.0	91.7	78.5	208.3	209.0	305.8	446.5	594.3	3957.4
1971	541.3	264.9	231.1	249.4	136.9	188.7	175.8	240.5	605.8	242.3	449.1	1051.5	4376.5
1972	367.0	29.5	24.6	186.7	273.0	65.0	184.1	63.0	150.8	689.6	606.0	814.3	3452.6
1973	206.2	264.4	202.2	196.1	83.8	61.7	105.2	173.5	218.3	234.4	558.5	877.8	3176.1
1974	0.0	234.4	182.9	278.4	277.4	77.7	220.5	200.9	250.1	188.5	127.5	737.1	2783.4
1975	311.4	221.0	290.2	346.7	190.0	367.8	192.0	433.6	288.8	269.3	454.4	822.2	4147.3
1976	702.5	84.8	133.1	269.0	0.0	34.3	255.8	158.5	18.8	207.8	656.3	722.9	3243.8
1977	74.7	181.1	198.9	367.5	181.3	117.3	106.9	120.9	75.7	655.3	431.5	524.2	3037.3
1978	195.6	51.1	298.7	194.0	604.2	112.8	266.9	192.8	64.0	620.0	572.7	852.4	4025.4
1979	350.3	100.6	147.3	305.3	145.0	184.7	128.8	163.8	300.2	504.7	365.0	528.6	3224.3
1980	145.8	0.0	92.7	408.7	86.6	95.0	97.8	179.6	164.1	263.9	602.7	246.9	2383.8
1981	231.6	214.4	134.1	144.5	125.7	199.9	232.9	145.3	209.3	203.7	284.2	436.6	2562.0
1982	41.4	46.0	167.1	136.4	236.4	167.6	114.8	85.1	110.7	410.2	555.5	893.3	2964.7
1983	452.9	0.0	32.3	12.2	330.9	0.0	84.3	120.2	71.1	364.2	388.9	962.7	2819.7
1984	529.4	455.9	227.3	341.4	51.6	169.2	230.6	144.0	546.9	323.6	653.7	285.0	3958.6
1985	419.3	316.2	423.4	69.8	284.5	468.9							**********
MEAN	502.8	247.1	206.4	277.4	180.3	164.9	163.2	153.4	183.1	424.9	478.0	648.1	3625.4

Table 2.1.14 MONTHLY RAINFALL AT MAPAKADAWEWA

Unit : mm

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1909	—	—	—	—	—	—	—	—	—	—	84.1	539.7	**********
1910	354.6	19.8	7.6	14.2	6.1	0.5	2.5	9.7	0.0	27.7	107.7	239.0	789.4
1911	202.7	0.4	0.5	0.0	0.0	1.3	0.0	28.7	34.5	150.6	395.2	1034.2	1856.1
1912	61.0	0.0	9.1	103.9	108.5	3.0	0.0	5.6	30.7	131.6	352.8	566.7	1372.9
1913	1387.5	111.5	25.9	49.0	9.1	5.6	2.0	0.0	17.8	97.0	130.6	821.1	2657.1
1914	581.9	30.5	71.6	27.9	0.0	0.0	0.0	1.5	118.1	230.4	705.1	856.5	2623.5
1915	684.2	24.6	447.0	151.9	12.7	20.1	0.0	34.5	13.2	61.0	35.1	—	**********
1916	160.5	11.4	21.1	110.7	103.4	0.0	74.4	57.1	135.4	72.4	374.6	233.7	1354.7
1917	523.2	234.9	339.1	65.0	43.2	0.0	80.0	69.1	145.3	374.6	301.7	211.1	2467.2
1918	—	—	—	—	—	—	—	—	—	—	—	—	**********
1919	—	—	—	—	—	—	—	—	—	—	—	—	**********
1920	—	—	—	—	—	—	—	—	—	—	—	—	**********
1921	—	—	—	—	—	—	—	—	—	—	—	—	**********
1922	—	—	—	—	—	—	—	—	—	—	—	—	**********
1923	—	—	—	—	—	—	—	—	—	—	—	—	**********
1924	—	—	—	—	—	—	—	—	—	—	—	—	**********
1925	—	—	—	—	—	—	—	—	—	—	—	—	**********
1926	—	—	—	—	—	—	—	—	—	—	—	—	**********
1927	401.3	252.0	233.7	39.4	14.5	0.0	2.5	24.1	42.7	67.3	25.4	—	**********
1928	367.3	33.0	7.9	127.0	6.9	0.0	6.3	0.0	2.8	11.7	122.7	119.4	805.0
1929	—	—	—	—	—	—	—	—	—	—	—	—	**********
1930	—	—	—	—	—	—	—	—	—	—	—	—	**********
1931	192.0	21.3	39.4	143.8	11.7	0.0	0.0	0.0	30.7	52.8	377.7	671.7	1341.1
1932	110.0	71.1	68.1	21.8	14.5	6.4	1.5	47.5	10.2	85.3	121.9	143.8	704.1
1933	1001.2	85.1	77.5	20.3	130.3	0.0	15.7	76.7	34.3	78.7	265.7	89.2	1874.7
1934	285.5	140.5	78.7	91.7	120.4	3.3	0.0	0.0	15.5	103.6	49.0	375.7	1263.9
1935	404.9	131.8	94.5	82.8	17.5	10.2	0.0	10.4	23.9	70.1	355.6	560.8	1762.5
1936	578.8	256.8	312.9	208.5	15.7	0.0	0.0	0.0	140.7	397.5	362.7	505.7	2779.3
1937	538.2	240.0	54.4	87.6	5.3	0.0	0.0	35.1	43.7	193.8	181.3	129.5	1508.1
1938	481.6	271.8	333.2	173.5	0.0	0.0	25.9	0.0	128.0	209.8	61.5	680.4	2365.7
1939	271.8	47.0	105.9	326.9	0.0	18.8	0.0	28.4	39.1	127.0	330.2	357.9	1653.0
1940	198.4	350.0	20.1	190.2	201.9	15.2	0.0	0.0	28.4	127.5	228.3	297.2	1657.2
1941	499.1	224.8	0.0	48.3	59.4	0.0	0.0	0.0	43.7	164.6	185.4	208.0	1433.3
1942	285.5	79.2	145.8	84.3	71.4	57.7	0.0	35.1	84.6	74.7	91.7	333.2	1343.2
1943	76.2	135.9	0.0	43.2	0.0	0.0	0.0	0.0	21.1	59.7	222.2	517.9	1076.2
1944	211.8	508.0	69.1	114.8	165.6	0.0	0.0	18.8	68.8	186.7	481.1	289.0	2113.7
1945	0.0	0.0	217.2	123.2	0.0	0.0	31.5	0.0	4.1	154.7	490.7	112.3	1083.7
1946	157.5	304.3	177.8	254.2	43.9	0.0	0.0	14.7	22.6	144.5	253.2	376.7	1749.4
1947	464.8	20.8	107.4	169.9	0.0	0.0	0.0	40.9	0.0	168.6	173.5	340.1	1486.0
1948	213.4	14.5	120.1	147.8	42.2	0.0	192.8	0.0	0.0	272.3	294.4	522.5	1820.0
1949	248.7	75.4	26.2	156.5	7.6	0.0	36.6	114.3	22.4	192.8	444.5	635.0	1960.0
1950	223.5	96.3	77.2	8.4	35.1	0.0	0.0	8.1	24.9	109.7	166.4	163.8	913.4
1951	672.1	79.2	61.0	80.0	26.9	0.0	39.6	75.9	72.9	128.3	429.2	438.9	2104.0
1952	637.8	76.2	30.5	232.9	85.8	0.0	18.5	0.0	152.9	8.1	179.8	225.3	1647.8
1953	392.2	238.2	103.6	115.1	0.0	0.0	45.7	0.0	36.1	134.1	198.1	488.9	1752.0
1954	240.8	338.1	125.2	109.7	43.2	0.0	12.7	4.8	0.0	81.8	142.7	372.9	1471.9
1955	388.9	290.8	107.2	110.7	0.0	0.0	0.0	111.5	175.3	74.4	120.1	166.1	1545.0
1956	218.2	78.0	104.4	50.5	0.0	182.4	21.3	23.6	12.4	284.0	459.2	462.0	1896.0
1957	240.5	306.6	57.1	85.3	56.1	6.3	38.9	2.3	129.0	250.7	496.0	1039.3	2708.1
1958	349.2	102.6	264.9	197.9	63.0	2.5	0.0	36.8	90.2	129.8	272.3	425.4	1934.6
1959	185.2	75.9	50.8	170.7	152.6	34.3	5.1	23.1	33.0	242.1	400.3	423.1	1796.2
1960	466.6	741.4	0.0	84.1	95.2	0.0	139.2	0.0	20.3	140.5	233.4	197.6	2118.3
1961	342.4	145.0	105.9	187.4	57.7	0.0	0.0	0.0	56.6	150.1	605.8	550.7	2201.6
1962	279.6	232.7	76.7	275.8	18.5	4.3	1.3	74.2	22.1	148.1	167.6	277.9	1578.8
1963	348.2	323.6	91.4	92.2	87.6	10.7	3.6	8.9	52.3	—	537.2	604.2	**********
1964	230.4	517.4	319.5	41.9	76.7	13.2	74.2	82.5	27.4	111.2	118.6	317.0	1930.0
1965	193.0	405.9	58.4	95.2	98.3	0.0	26.9	248.1	0.0	189.5	429.5	448.8	2193.6
1966	344.9	116.1	353.8	126.2	36.1	4.6	0.0	149.9	59.4	192.0	260.3	256.0	1899.3
1967	154.4	263.4	62.0	35.3	32.8	35.6	0.0	3.0	56.1	173.0	409.4	320.8	1545.8
1968	181.9	6.9	181.9	42.9	22.1	51.1	0.0	26.4	69.8	107.2	223.0	294.9	1208.1
1969	323.3	188.2	29.2	253.7	11.9	0.0	14.2	89.4	45.5	322.6	63.5	479.3	1820.8
1970	411.0	509.0	56.9	72.1	—	0.0	0.0	—	—	55.1	366.3	474.2	**********
1971	495.5	78.0	105.2	96.5	33.0	0.0	39.4	61.0	70.1	150.9	—	775.9	**********
1972	—	0.0	10.2	—	5.6	—	—	—	—	—	—	—	**********
1973	—	105.9	34.3	14.7	98.5	38.1	—	—	—	115.3	—	—	**********
1974	0.0	196.8	10.2	190.5	72.9	0.0	12.7	31.7	68.6	38.1	460.5	524.0	1606.0
1975	258.6	118.1	90.9	—	—	—	—	93.7	318.2	158.5	218.9	414.0	**********
1976	561.1	45.2	24.4	94.7	60.2	84.6	17.5	58.7	15.0	102.1	370.8	273.5	1707.6
1977	67.3	64.8	81.3	80.0	66.8	0.0	76.7	14.5	131.1	392.9	295.4	520.9	1791.7
1978	174.2	237.2	50.3	98.8	61.7	0.0	53.8	0.0	7.6	212.6	207.5	539.5	1643.2
1979	115.6	20.1	26.7	73.2	0.0	0.0	0.0	0.0	87.6	177.3	—	300.0	**********
1980	133.0	0.0	61.0	113.0	79.0	0.0	3.0	25.5	15.0	205.5	219.5	100.5	955.0
1981	62.0	120.0	4.0	18.5	37.5	—	—	—	—	—	—	—	**********
1982	—	—	—	—	—	—	—	—	—	—	—	—	**********
1983	—	—	—	—	—	—	—	—	—	—	—	—	**********
1984	—	—	—	—	—	—	—	54.3	156.3	78.7	—	167.5	**********
1985	369.3	211.9	146.3	127.5	54.4	37.6							**********
MEAN	333.4	161.8	99.6	109.2	46.3	11.0	19.6	33.8	57.0	148.3	275.2	407.1	1703.3

2.2 WATER RESOURCES

2.2.1 DISCHARGE ANALYSIS

Discharge Analysis is carried out using TANK MODEL to evaluate yield from the Heen Ganga. Computer Programme for discharge analysis is composed of two parts, TANK1 and TANK2:

TANK1 : programme for estimating the parameters of TANK MODEL

TANK2 : programme to estimate a long term yield using the estimated parameters.

Discharge record from Heen Ganga is not available, and there is no meteorological station in the basin. In this limitation, parameters of the model were determined using TANK1. Following values were used to make TANK MODEL of Heen Ganga:

Catchment area : 113.9 sq.km

Rainfall : records of Hembarawa.

Estimated result is shown in Fig.2.2.2. Bottom hole of the lowest tank, which denotes groundwater seepage, is selected to be 0.0001, the lowest because the riverbed is bedrock of granite and granite gneiss.

It was informed through the interviews with village people that discharge in April and May, in June and in July will be 5,3,1 cu.m/sec, respectively in normal year.

2.2.2 HEEN GANGA DAM

Heen Ganga will be diverted to the main canal by the anicut for the irrigation of Stage III and IV. Diversion discharge is 3 cu.m per sec. It is expected that annual rainfall and rainy season will be fluctuated due to fluctuation of monsoon wind. It is recommended to construct new reservoir upstream the anicut considering the fluctuation.

Dam site is selected at 2 km upstream of the existing anicut considering the topographical conditions. The location is shown in Fig. 2.2.4.

Catchment Area : 101.3 sq.km

Sedimentation : 4.1×10^6 cu.m

Effective Storage : 17.1×10^6 cu.m

(2 cu.m/sec x 86,400 sec/day x 90 days x 1.1)

Resevoir area and capacity curves are shown in Fig.2.2.5, which gives

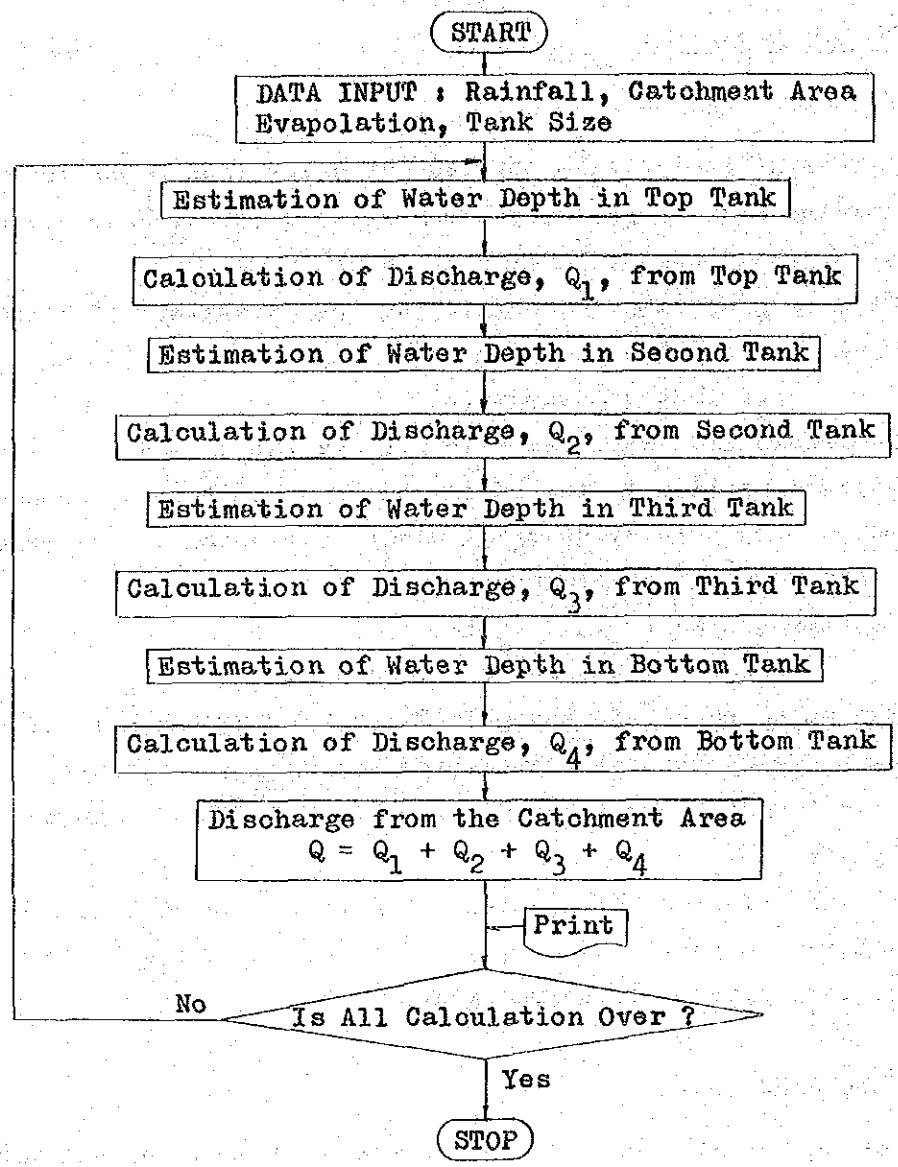

Fig.2.2.1 TANK MODEL FLOW CHART

Table 2.2.1 RAINFALL AT HEMBARAWA - 1985 Unit : mm

/Month/ /Day/	1	2	3	4	5	6	7	8	9	10	11	12
1	99.9	34.5	0.0	1.9	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0
2	24.0	8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	5.1	72.3	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	54.3	5.7	0.0	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0
5	5.8	0.0	0.0	2.8	0.0	7.8	0.0	0.0	0.0	0.0	0.0	0.0
6	3.6	0.0	0.0	32.9	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0
7	0.0	11.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9
10	0.0	0.0	23.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.6	22.9
11	0.0	0.0	52.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.9	5.5
12	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	42.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.2	0.0
16	25.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.4	0.0
17	44.6	0.0	6.4	0.0	12.9	0.0	0.0	0.0	21.1	0.0	0.0	0.0
18	7.6	0.0	0.0	0.0	23.8	0.0	68.0	0.0	0.0	0.0	20.0	2.7
19	8.9	7.2	0.0	0.0	0.6	0.0	0.0	0.0	2.4	0.0	30.4	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	22.1	0.0	16.5	0.0	3.3	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	1.1	20.6	7.2	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.4	0.0	1.8	56.5
24	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.8	0.0	0.0	8.0
25	0.0	33.3	6.1	0.0	0.0	0.0	0.0	0.0	8.0	0.0	21.3	0.0
26	0.0	32.8	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.0	26.1	4.0
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	6.4	30.2	7.2
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.9	5.8	21.1	0.0
29	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.9	0.0	0.0
30	18.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	18.7	0.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KEI	373.4	205.9	104.8	40.3	37.3	11.0	90.9	0.0	184.9	49.9	244.3	115.7
AVE	12.0	7.4	3.4	1.3	1.2	0.4	2.9	0.0	6.2	1.6	8.1	3.7

NEN-GOUKEI = 1458.4

Table 2.2.2 DISCHARGE AT HEEN GANGA ANICUT - 1985 Unit : cu.m/sec

/Day/ \ /Month/	1	2	3	4	5	6	7	8	9	10	11	12
1	66.753	68.270	56.892	26.550	3.793	3.034	2.276	0.759	0.759	6.068	22.757	45.514
2	56.892	60.685	53.099	26.550	3.793	3.793	2.276	0.759	0.759	6.068	18.964	41.721
3	60.685	60.685	46.272	26.550	3.793	3.034	2.276	0.759	0.759	5.310	18.964	37.928
4	53.099	87.234	40.204	26.550	3.793	3.034	2.276	0.759	0.759	4.551	15.171	37.928
5	91.027	113.784	53.099	26.550	5.310	3.034	2.276	0.759	0.759	3.034	11.378	41.721
6	60.685	60.685	45.514	26.550	4.551	3.034	1.517	0.759	0.759	2.276	11.378	37.928
7	45.514	56.892	41.721	26.550	3.793	3.034	1.517	0.759	0.759	1.896	7.586	37.928
8	41.721	72.063	37.928	60.685	3.793	3.034	1.517	0.759	0.759	1.896	6.068	34.135
9	41.721	60.685	37.928	53.099	3.793	3.034	1.517	0.759	22.757	1.896	22.757	30.342
10	34.135	49.306	136.541	49.306	3.793	3.034	1.517	0.759	18.964	1.896	18.964	30.342
11	34.135	37.928	147.919	45.514	3.793	3.034	1.517	0.759	15.171	1.896	30.342	45.514
12	30.342	34.135	144.126	37.928	3.793	3.034	1.517	0.759	7.586	1.517	37.928	37.928
13	30.342	30.342	91.027	22.757	3.793	3.034	1.517	0.759	6.068	1.517	30.342	34.135
14	30.342	30.342	68.270	22.757	3.793	3.034	1.517	0.759	5.310	1.517	26.550	26.550
15	30.342	30.342	56.892	22.757	3.793	3.034	1.517	0.759	4.551	1.517	34.135	26.550
16	91.027	26.550	53.099	21.240	3.793	3.034	1.517	0.759	3.793	1.517	75.856	26.550
17	121.370	2.276	41.721	21.240	3.793	3.034	1.517	0.759	3.793	1.517	68.270	26.550
18	121.370	22.757	37.928	18.964	22.757	3.034	1.517	0.759	37.928	1.517	121.370	15.171
19	91.027	22.757	30.342	18.964	37.928	3.034	3.793	0.759	30.342	1.517	121.370	15.171
20	60.685	60.685	53.099	18.964	34.135	3.034	3.034	0.759	60.685	1.517	75.856	15.171
21	53.099	56.892	34.135	18.964	22.757	3.034	2.276	0.759	37.928	1.517	60.685	15.171
22	49.306	53.099	30.342	18.964	19.723	3.034	1.517	0.759	37.928	22.757	56.892	15.171
23	45.514	41.721	26.550	18.964	15.171	3.034	1.517	0.759	37.928	18.964	53.099	15.171
24	45.514	41.721	26.550	18.964	11.378	3.034	1.138	0.759	7.586	12.137	45.514	113.784
25	45.514	37.928	26.550	18.964	7.586	3.034	1.138	0.759	11.378	9.103	60.685	75.856
26	41.721	60.685	30.342	18.964	13.654	3.034	0.910	0.759	7.586	7.586	91.027	68.270
27	37.928	45.514	22.757	18.964	11.378	3.034	0.941	0.759	6.827	9.103	75.856	60.685
28	37.928	91.027	18.964	18.964	7.586	3.034	0.759	0.759	7.586	21.240	98.613	56.892
29	30.342	0.000	18.964	18.964	7.586	3.034	0.728	0.759	11.378	37.928	64.478	53.099
30	60.685	0.000	18.964	18.964	6.068	3.034	0.842	0.759	7.586	34.135	53.099	45.514
31	53.099	0.000	18.964	0.000	5.310	0.000	0.751	0.759	0.000	22.757	0.000	37.928
KEI	1693.865	1416.990	1546.704	789.661	289.770	91.786	50.444	23.515	396.727	247.670	1435.954	1202.318
AVE	54.641	50.607	49.894	26.322	9.347	3.060	1.627	0.759	13.224	7.989	47.865	38.784

NEN-GOUKEI = 9185.403

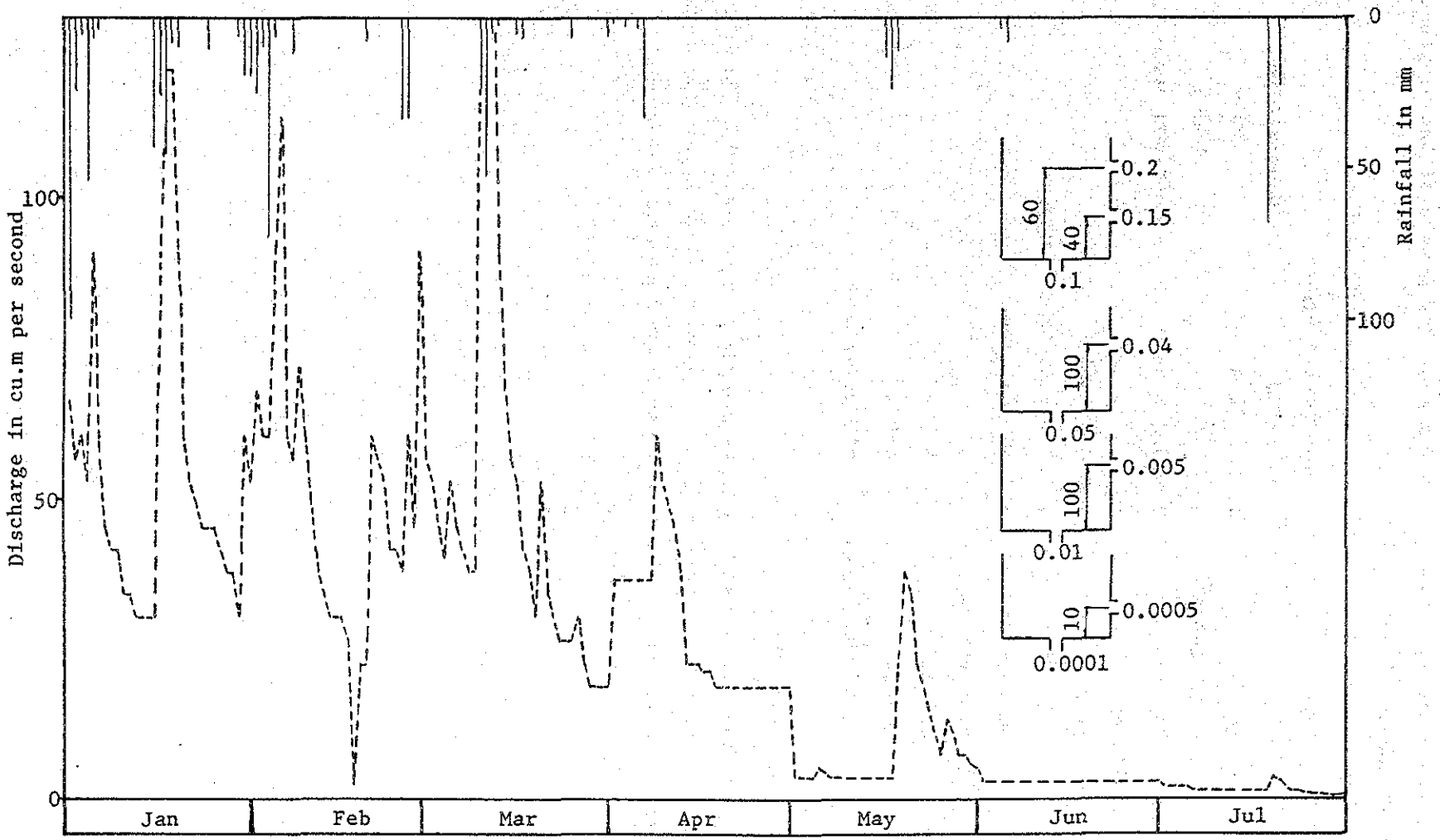

Fig.2.2.2 DISCHARGE ESTIMATED BY TANK MODEL - HEEN GANGA ANICUT

full water level, F.W.L as 145.7 m MSL. Parameters of the proposed dam are shown below:

Dam			
Type	:	Combination type	
		Fill Dam	Concrete Dam
Height	:	37 m	19 m
Crest Length	:	440 m	860 m
Volume	:	970,400 cu.m	68,600 cu.m
Spillway			
Type	:	Radial Gate	
Gate Size	:	6.0 m x 6.0 m x 5 Nos.	
Max. Discharge	:	1,300 cu.m/sec	
Diversion Tunnel			
Radius	:	8.5 m	
Length		480 m	
Flood Discharge	:	660 cu.m/sec.	

2.2.3 Existing Tanks

Parameters of existing tanks are shown in Table 2.2.3 and 2.2.4. Tanks rehabilitated by IRD Project are shown in Table 2.2.3. Tanks, shown in Table 2.2.4, were constructed recently on left bank of the Minipe main canal.

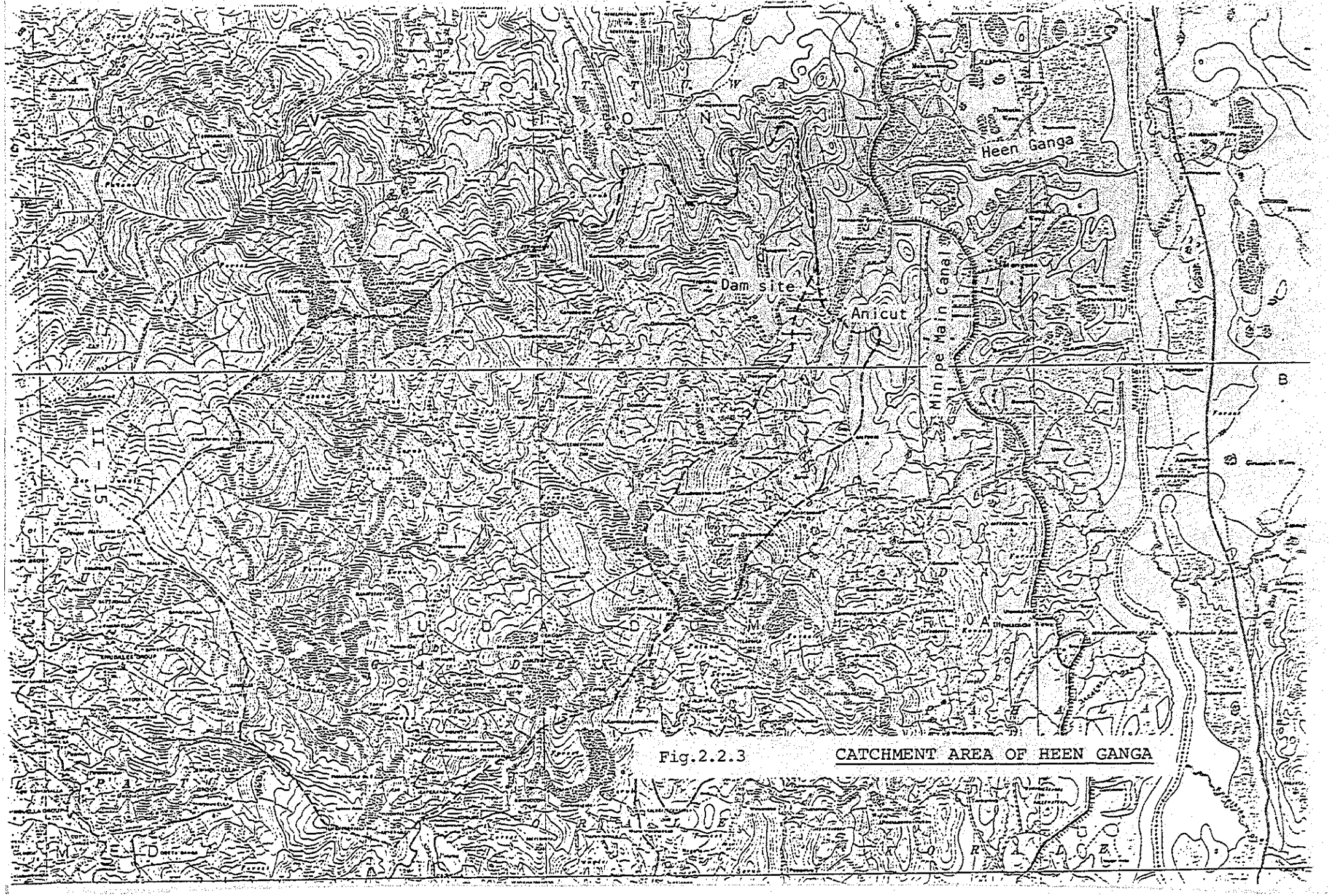

Fig.2.2.3 CATCHMENT AREA OF HEEN GANGA

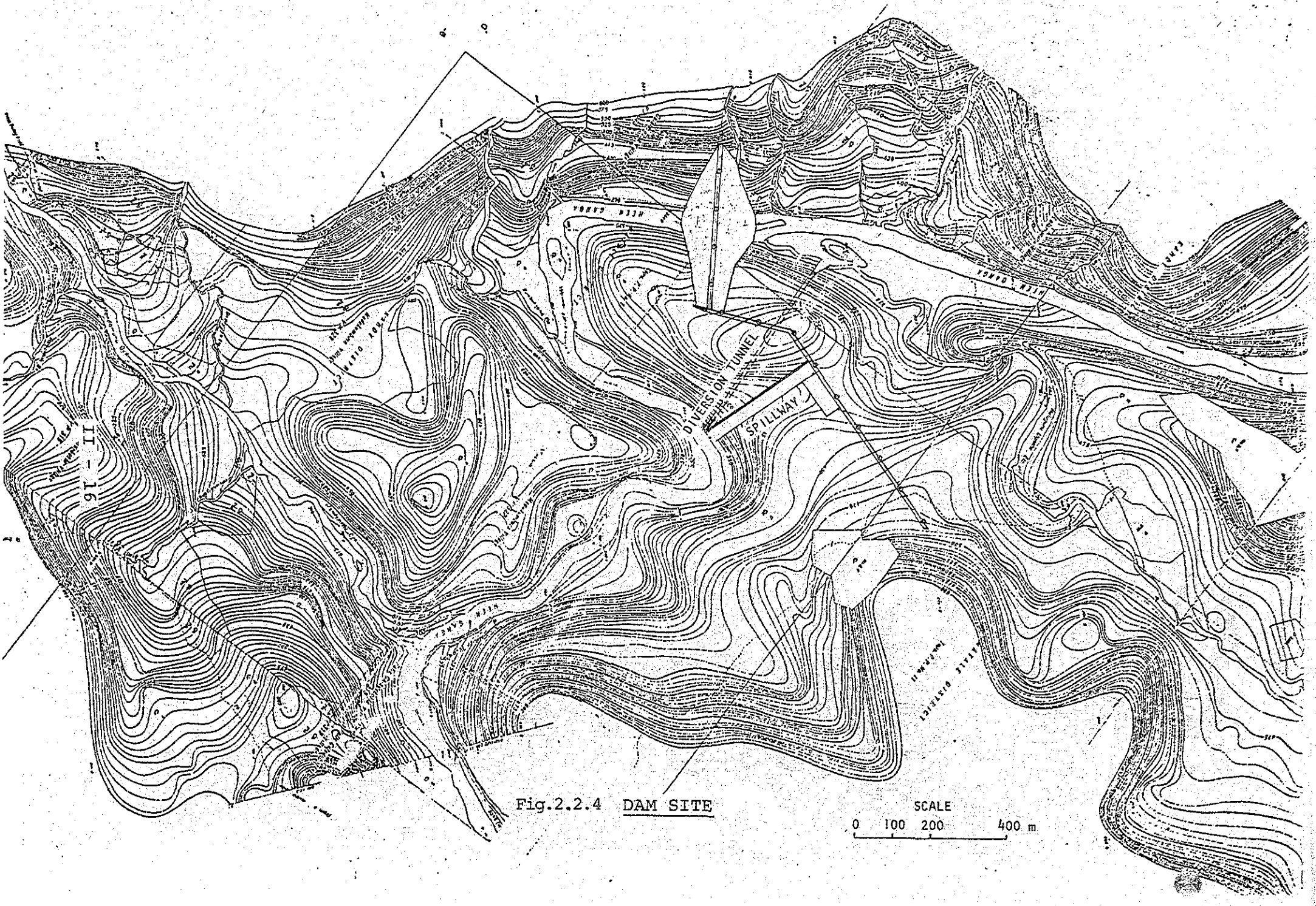

Fig.2.2.4 DAM SITE

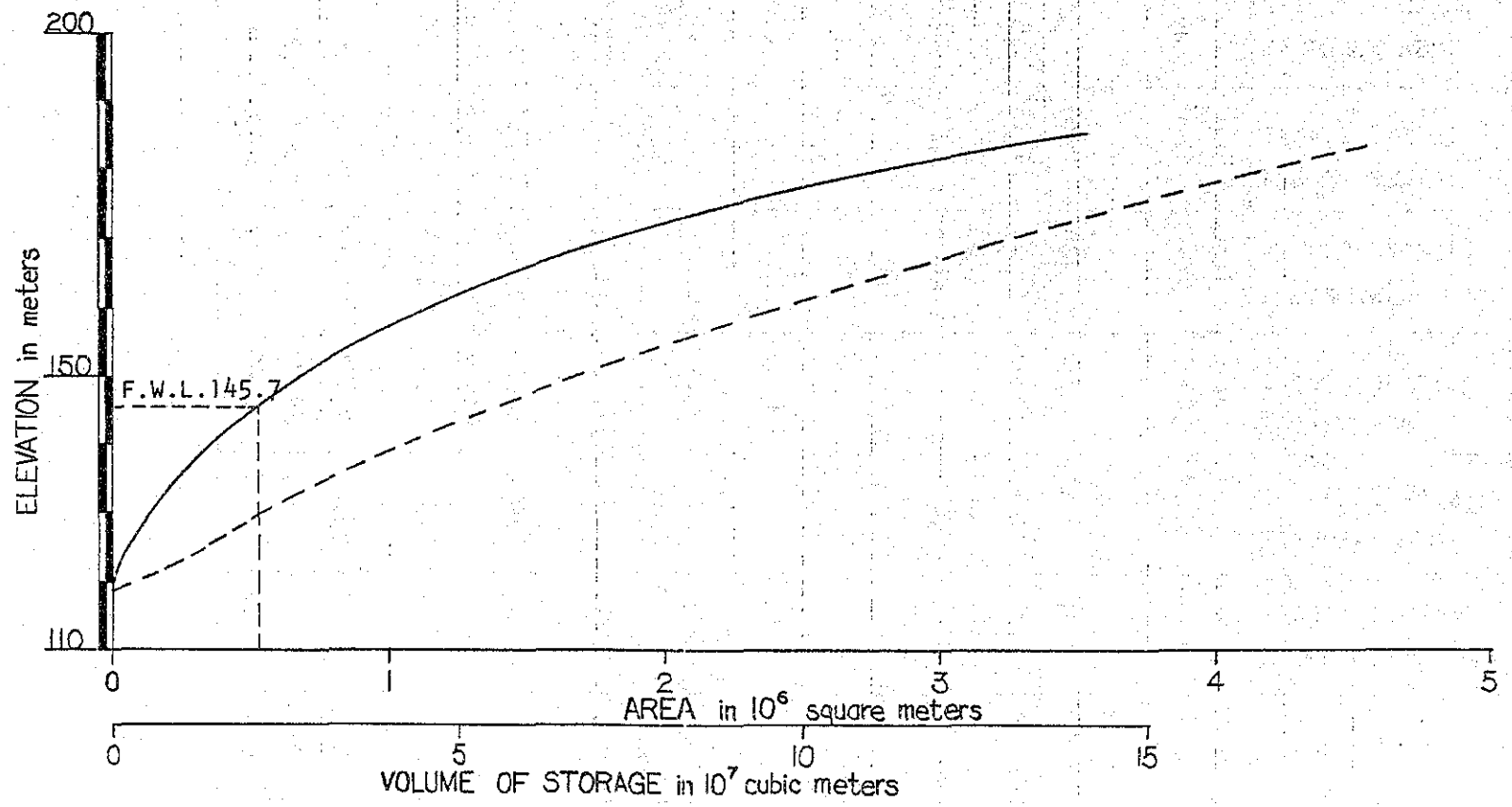

Fig.2.2.5 RESERVOIR AREA AND CAPACITY CURVES OF HEEN GANGA DAM

Table 2.2.3 TANK PARAMETER

DATA	UNIT	NAME & CO-ORDINATES OF TANK						
		MAHAWATENNA WEWA J/12(1.95x3.70)	DEWAGIRI WEWA J/12(1.70x6.6)	BOGAHA WEWA J/12(2.5x7.95)	BALUGAMMANA WEWA J/12(3.0x8.2)	MARAKA WEWA J/12(3.3x8.7)	RADDUNNE WEWA J/7(3.35x0.70)	KARAUGAHAWELA WEWA J/7(1.25x1.50)
CATCHMENT AREA	sq.km	5.18	1.97	5.18	0.26	0.78	0.52	29.79
CAPACITY	1000 cu.m	895.5	117.2	592.1	74.0	61.0	49.3	2,245.0
BUND								
Length	m	236	165	732	488	640	549	1,097
Top Level	M.S.L.	83.20	84.43	78.83	73.80	74.33	72.33	83.68
Top Width	m	1.83	1.83	1.83	1.83	1.83	1.83	3.66
Side Slope U/S & D/S		1 on 2	1 on 2	1 on 2	1 on 2	1 on 2	1 on 2	1 on 2
SPILLWAY								
Type L.B.		-	C.O.	-	-	C.O.	-	C.O.
R.B.		C.O.	-	C.O.	C.O.	-	C.O.	RADIAL GATE
Length L.B.	m	-	13.7	-	-	18.3	-	91.4
R.B.	m	61.0	-	51.8	12.2	-	12.2	6.1x3.0
Crest Level L.B.	M.S.L.	-	83.21	-	-	73.15	-	82.16
R.B.	M.S.L.	81.83	-	77.77	72.54	-	71.32	82.16
SLUICE								
Type L.B.		Tower	Tower	Tower	Tower	Tower	Tower	Tower
R.B.		-	-	Tower	-	Tower	Tower	Tower
Size of Opening L.B.	cm	61.0	15.2	15.2	15.2	61.0	30.5	30.5
R.B.	cm	-	-	15.2	-	15.2	15.2	61.0
Sill Level L.B.	M.S.L.	78.47	79.85	74.81	71.17	72.24	70.10	Cut on Rock
R.B.	M.S.L.	-	-	74.22	-	71.32	70.10	76.06
Irrigable Area	sq.km	1.38	0.26	1.00	0.39	0.59	0.93	2.42

Table 2.2.4 Recently Constructed Tank Parameter

DATA	UNIT	TANK NAME	
		NAMINI WEWA	HIBIRIYAKADA WEWA
CATCHMENT AREA	sq.km	5.39	7.64
CAPACITY	1000 cu.m	677.2	1,677.5
BUND			
Length	m	670	869
Top Level	M.S.L.	100.89	122.53
Top Width	m	3.05	3.66
Side Slope U/S		1 on 2.5	1 on 2.5 Breach 1 on 3
D/S		1 on 2	1 on 2 Breach 1 on 2.5
SPILLWAY			
Type L.B.		Natural with crest wall and 1:100 tail gradient	Natural with crest wall and 1:100 tail gradient
Length L.B.	m	45.7	53.3
Crest Level L.B.	M.S.L.	99.36	121.01
SLUICE			
Type L.B.		Hume Pipe Tower	-
R.B.		-	Hume Pipe Tower
Size of Opening L.B.	cm	61.0	-
R.B.	cm	-	61.0
Sill Level L.B.	M.S.L.	96.01	-
R.B.	M.S.L.	-	114.30
Irrigable Area	ha	60.7	161.9

2.2 WATER RESOURCES

Two new reservoirs, Liyangahawela and Loggal Oya, were proposed by the Irrigation Engineer's Office, Mapakada to overcome the water shortage of every year.

Location of the proposed water resources are shown in Fig.2.2.1. Longitudinal section and reservoir area and capacity curves are shown in Fig.2.2.2 and 2.2.3, respectively.

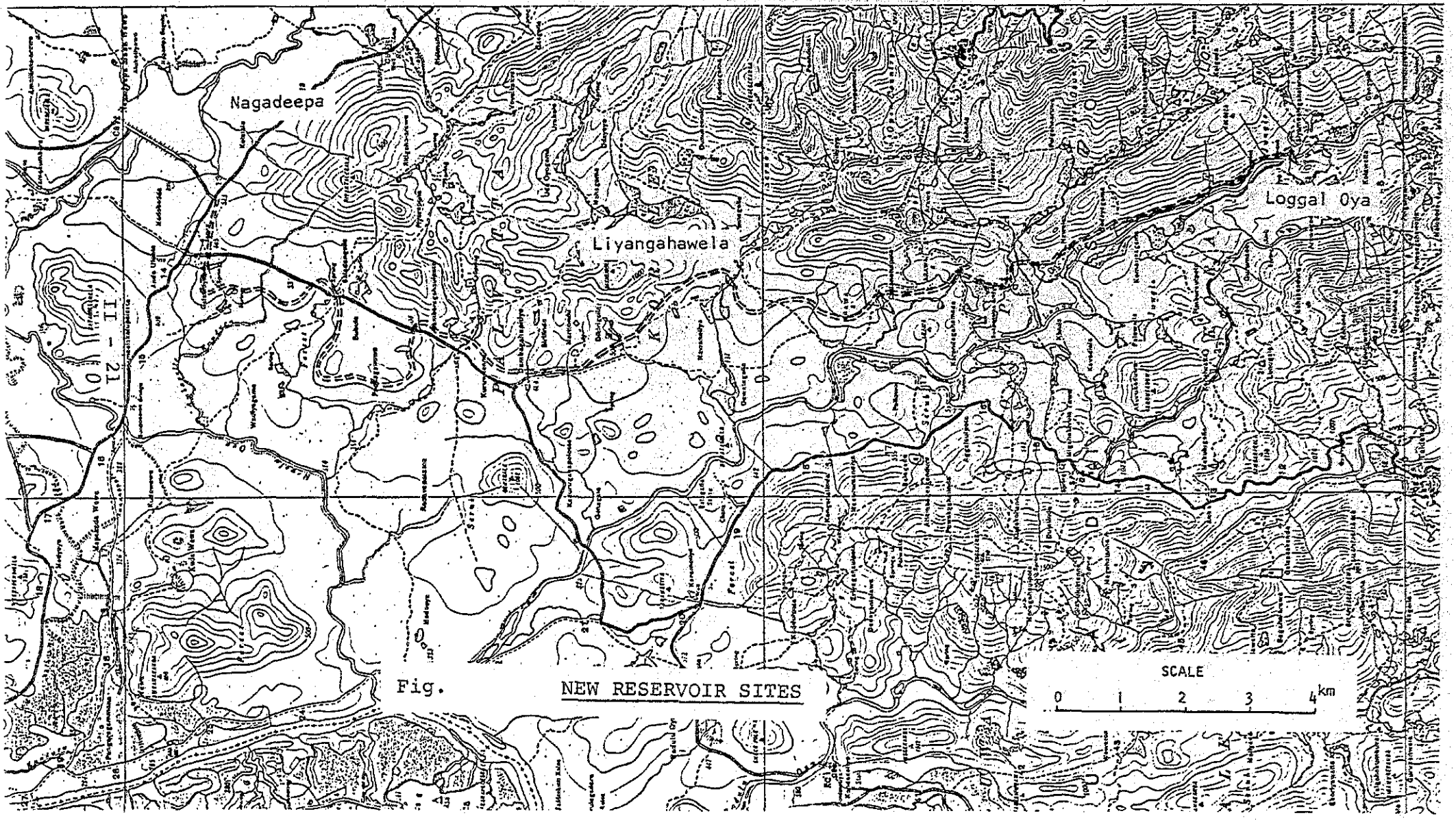

Fig. NEW RESERVOIR SITES

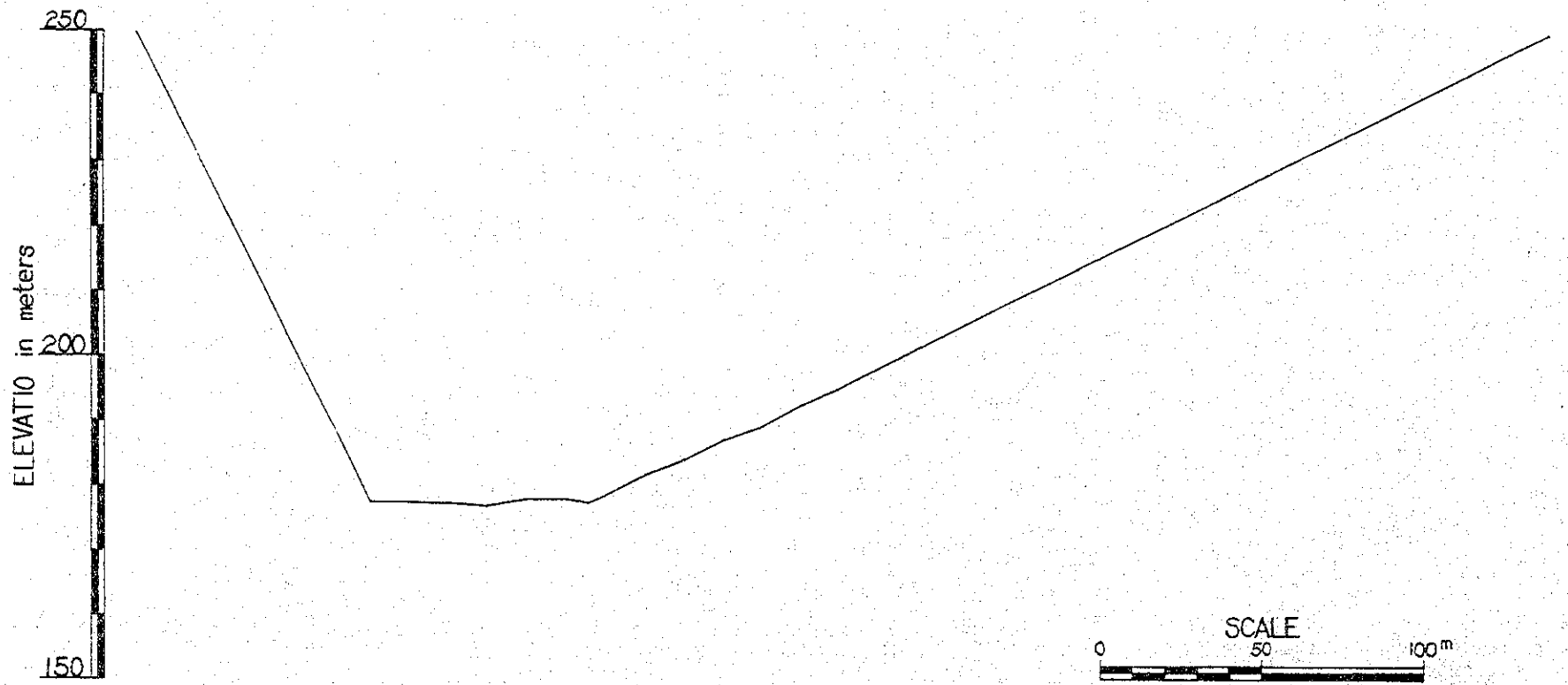

Fig.2.2.2 LOGGAL OYA LONGITUDINAL SECTION

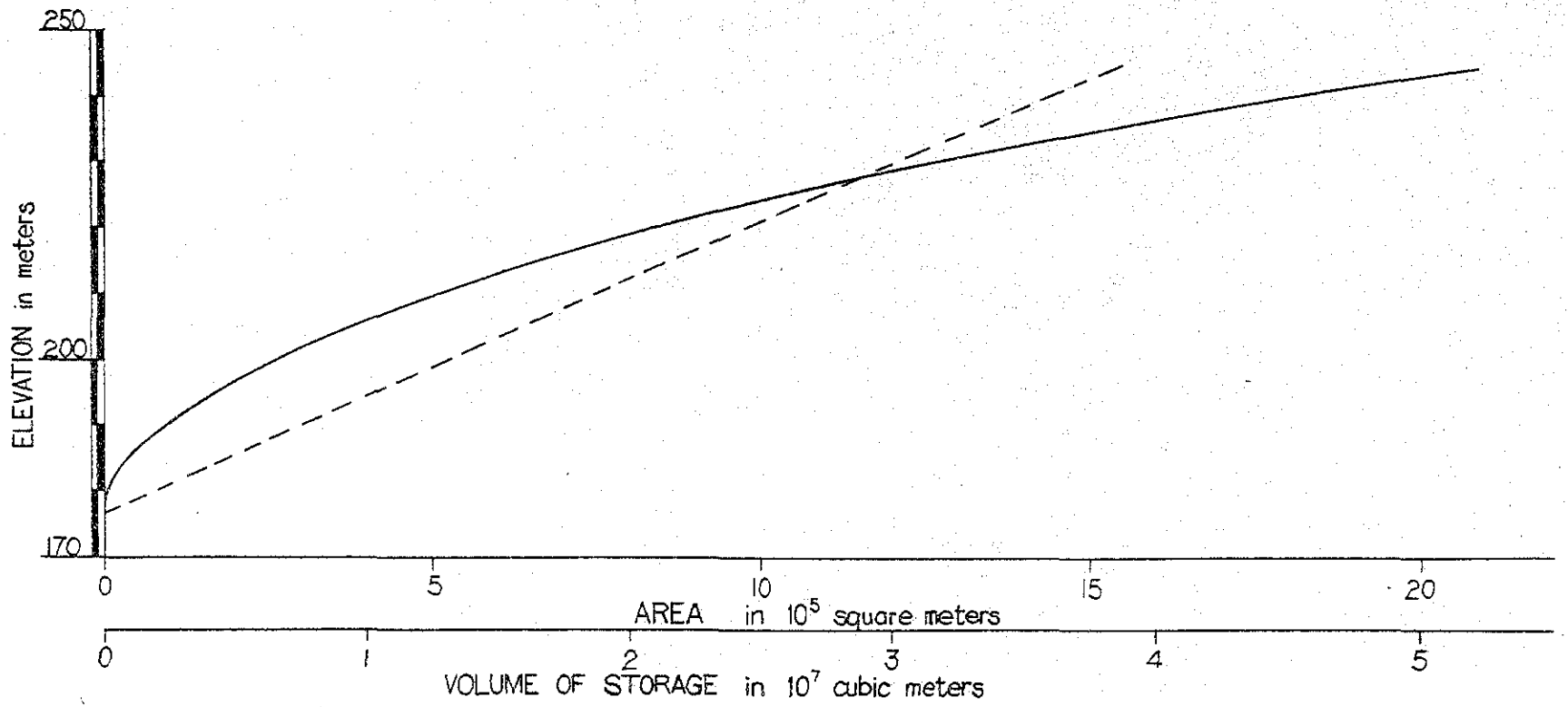

Fig.2.2.3 RESERVOIR AREA AND CAPACITY CURVES OF LOGGAL OYA DAM

ANNEX 3 SOIL

Contents of Tables and Figures
(MINIPE SCHEME)

Contents of Tables and Figures
(NAGADEEPA SCHEME)