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DEMOCRATIC SOCIALIST REPUBLIC
OF
SRI LANKA

MINISTRY OF LANDS, IRRIGATION
&
MAHAWELI DEVELOPMENT

# IRRIGATION SYSTEMS MANAGEMENT PROJECT
USAID CONTRACT 383-0080-C-00-7035

# END OF TOUR REPORT

BY

D.S.A. KULASEKERA
SYSTEMS OPERATION ENGINEER

SHELADIA ASSOCIATES INC.

DECEMBER 1990

SHELADIA Associates, Inc.
Consulting Engineers Irrigation Systems Management Project
35/7 Gregory's Road, Colombo 7. P. O. Box 1874, Colombo. Tel: 596034

Riverdale
Colombo
Polonnaruwa

March 12, 1991

D. Jenkins
ISMP Project Officer
USAID
Colombo

Subject: End of Tour Report - D.S.A. Kulasekera
Systems Operation Engineer

Dear Mr. Jenkins,

Prior to Mr. Kulasekera's departure from the ISMP on 22 December 1990 he prepared an End of Tour Report in accordance with the requirements of the Consultants' agreement with USAID. The delay in issuing the Report was due to preparation of Exhibits and Annexures. The Report presents the proposed Systems Operation Plan for ISMP and what has been accomplished to date to implement that Plan. In addition, a schedule for implementing the outstanding requirements of the Plan within the LOP has been presented along with recommendations for modifications to the Plan to initiate improvements.

Transmitted herewith is one copy of Mr. Kulasekera's Report. Additional copies will be available at a later date if you so desire.

Very truly yours,

C. F. Leonhardt

C. F. Leonhardt
Chief-of-Party/SAI

Encl: 1 Copy DSA Kulasekera End of Tour Report

cc. G. T. Jayawardena w/Report
L. T. Wijesooriya w/Report
DDI Polonnaruwa w/Report
DDI Kurunegala w/Report
DDI Ampara w/Report
SAI Polonnaruwa w/ Report
SAI Home Office w/Report
D. S. A. Kulasekera w/Report
SAI CMB w/Report

t-rpt.dsa

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# END OF TOUR REPORT

## D.S.A. KULASEKERA - SYSTEMS OPERATIONS ENGINEER

## TABLE OF CONTENTS

# PREFACE

The opinions expressed herein are those of the author and may or may not concur with those of other Sheladia Associates.

My assignment as a member of the ISMP Technical Assistance (TA) Team, provided me with the opportunity and time to investigate, observe, read, listen, ponder and look at surface irrigation systems from a wide perspective. Arising from these experiences I attempted to make notes on various issues, during the last three years that I was on this project. Although they are incomplete I have taken the liberty of attaching them as Annexures to this Report.

As a Sri-Lankan Irrigation Engineer familiar with irrigation systems of this nature, my intents in the ISMP were not combined to the O&M component.

While carrying out my duties I was conscious of the fact that Ridi Bendi Ela and Polonnaruwa Range Irrigation Schemes form an important part of my heritage and the need to preset and upgrade these Schemes was uppermost in my mind. There interests may have contributed to the disagreements and even acrimonious debates I often had with my colleges who formed the multideceplinary team charged with the responsibility of evolving strategies to achieve the socio-economic objectives of the Project.

I wish to express my sincere thanks to all those who helped to further my education.

# CHAPTER I

## PROJECT ASSIGNMENTS.

The Consultant was assigned to the Project in October 1987 as Associate Irrigation Engineer. Duties were not defined but the understanding was that the Consultant was to assist the Irrigation Engineer in carrying out his duties pertaining to the O&M component of the ISMP which comprised the following main elements:

- Investigation, planning, design and implementation of structural improvements to existing irrigation systems.
- Development and implementation of a water management improvement program.
- Development and implementation of preventative maintenance programs for sustained renewal of the systems.

The assignment entailed:

- Assisting the ID in drawing up proposals and estimates for structural improvements.
- Design of cost effective techniques and hydraulic structures
- Assisting the ID in quality control and supervision of construction
- Development of the methodology for assessment and scheduling of maintenance needs.
- Drawing up of an action plan for improving system operations.
- Design of water measuring devices.
- Carrying out operation surveys and identification of the location and type of control and measuring devices for effective regulation and monitoring of canal deliveries.

On February 1, 1989 the Consultant was assigned to work on system operations and was mainly engaged in the following activities:

- Review of previous studies, field observations and collection of data pertaining water management.

Identification of system operation activities, such as, repetitive computations, storage of information and production of evaluation reports, which could best be carried out by computers and setting out input and output requirements for computer models.

Development of a conceptual plan for implementing computer assisted water schedules

Preparation of control and issue diagrams for scheduling canal deliveries

Identifying training needs for implementation of computer assisted system operations model.

With effect from October 1, 1989 the Consultant was designated System Operations Engineer and the duties listed. List of duties and responsibilities are presented in Exhibit I-1.

## SYSTEMS OPERATIONS / WATER MANAGEMENT SPECIALIST

Duties and Responsibilities:

This assignment will involve a period of 21 months beginning on 1 October 1989. The scope of services for the Sri Lankan Systems Operations/Water Management Specialist will be as follows:

A. The systems Operations/Water Management Specialist shall study each of the existing irrigation systems in the Polonnaruwa Range as separate irrigation schemes and as components of a comprehensive complex water management system dependent upon a new national source of water (Mahaweli system).

B. This specialist shall assist in making a detailed study of the Giritale scheme including reservoir inflows, of the two intermediate reservoirs - namely Kaudulla Wewa and Dambulla Wewa, drainage inflows into the systems and reuse of drainage water.

C. Assuming continuous flow in the D channel, as per the design criteria of the Irrigation Department (ID), a study will be made, in coordination with the Agronomist and DOA, of the cropping patterns and water requirements, utilizing the implementation areas in the system as preliminary basis to develop a System Operations Plan. Priority will be given to the Giritale Scheme.

D. The system Operations/Water Management Specialist shall closely consult with the Sub Project Committee (SPC) responsible for the sample distributory areas to evaluate the present on-farm water management practices. In conjunction with an agronomist or agriculturist, and the Department of Agriculture (ADA/Polonnaruwa) he shall make recommendations to improve systems operations to reduce the wastage of water due to staggered cultivation within a block which is presently employed by farmers.

E. The Sri Lankan systems Operations/water Management Specialist shall assist the Expatriate Systems Operation Specialist to evaluate the discharge capacities of sample areas to determine the capability of existing structures to deliver the water requirements for both rice and other food and fibre crops.

F. The Systems Operations/Water Management Specialist, in consultation with the Expatriate Systems Operation Specialists, the Agronomist and ADA/Polonnaruwa shall recommend the most suitable rotation pattern within the system (scheme) to fully satisfy the farm block with respect to the special requirements of the farmers under each D-channel of the system (scheme), for cultivation of rice and other field crops depending on soils.

G. This Specialist, in close coordination with the Expatriate Systems Operation Specialist, and the Irrigation Department personnel, shall study the Giritale Scheme in detail review the proposed measuring devices at the distributory turnout and at each of the field canal turnouts and make recommendations for system (scheme) improvement and suggestions for monitoring the recording measurements by the SFC or ID in order to ensure equatable distribution of water to each farmer with respect to the area and crop water requirements for each bock (this will be utilized in the Systems Operations Model).

H. The Systems Operations/water Management Specialist in close coordinating with the Expatriate Systems Operations Specialist and Irrigation Department personnel shall develop system operation plans for each of the four Polonnaruwa Schemes, Ridi Bendi Ela Scheme, Gal Oya Scheme and any other scheme which may be taken up by ISMP.

I. This specialist shall work closely with the ID personnel and the computer Modelling Specialist in developing and refining computer models for water scheduling in each of the irrigation systems covered by ISMP or any modification recommended byID/IMD/USAID.

J. The systems Operation/Water Management Specialist shall assist the ID in implementing the system operation plans and evaluating the performance of the irrigation systems.

K. This specialist shall work closely with the I.D in calibrating, refining, and transferring the Giritale Model to other schemes.

L. He will be responsible with assistance from a computer programmer for preparing three computer models for the schemes under the project, namely, a reservoir operation model, a system operation/water management model, and a seasonal water report model.

M. At the end of this assignment a detailed report shall be prepared by the systems Operation/Water Management Specialist on the findings and recommendations to improve the systems operation for the four Polonnaruwa Schemes, Ridi Bendi Ela Scheme or any other scheme which may be taken up by ISMP.

Duty&res.dsa

# CHAPTER II

## SYSTEM OPERATIONS - PRE-PROJECT STATUS

Irrigation Department being a well established old technical department, has over the years set down guidelines, norms and criteria for the design, construction, operation and maintenance of irrigation systems. However due to various factors such as insufficiency of O&M funds, changes in the working environment, increased value of irrigation water caused by competing demands, it cannot be said that the irrigation systems were operated efficiently considering the improved infrastructural facilities and technologies presently at the disposal of the Irrigation Engineer. It is to the credit of the Irrigation Engineers of a by gone era that these systems which have been designed and constructed to conserve and re-use water, operate at acceptable efficiencies even under poor management conditions.

In general there were no water measuring devices other than the ratings at the head sluice except in Gal Oya LB Scheme in which a water management program had been implemented under the Gal Oya Water Management Project (1980-85). However, water issues to branch and the larger D canals were controlled with the help of gages installed in the canals. Although the quantity of water passing through a gaged section could not be assessed with any degree of accuracy, these gages helped to maintain supplies at levels determined from operational experience gained over the years. In some cases the farmer representative initialed the gage records maintained by ID field staff signifying acceptance and were satisfied when canal water levels were maintained at the pre-determined gage readings.

Due to encroachment of reservations, cultivation of highlands and post construction changes to the distributary system, the extent of land irrigated by any particular outlet was not known accurately and is considerably more than originally designed for.

In most cases the "issue trees" (schematic water distribution diagrams) which had been prepared from blocking out plans (BOP) and updated from time to time to reflect changes, were found to be inaccurate when checked in the field.

The control and distribution of water in the canal system up to field canal head gates is the responsibility of the ID and is put into effect through field depots manned by Technical Assistants. On the average, a TA covers an extent of about 5000 Acres of irrigated lands and is generally assisted by two Work Supervisors (WS). The operation of the gates is accomplished by water issue labourers, each of whom is responsible for a area of about 500 Acres.

Due to poor communication facilities between field depots and IE's office, the system cannot be operated to reflect unanticipated changes, such as, rain or changes in canal discharges on the request of farmers.

Since there was no measurement of canal deliveries the performance of the irrigation system depended on the experience, ability and the degree of motivation of the ID staff responsible for operations.

Due to measures incorporated in the system design, such as, absorbtion of catchment inflows and re-use of drainage water the irrigation system efficiencies are high, specially during the Yala season. During the Maha season when precipitation is heavy the irrigation efficiencies are low due to inefficient use of effective rainfall. Further discussion on the system efficiencies is given in Annexure N - 6.

# CHAPTER III

## ACTION PLAN FOR IMPROVING SYSTEM OPERATIONS

After reconnaissance surveys of the physical systems, study of prevalent water management practices and ID guide lines, an action plan for improving system operations was developed with the assistance of the ID technical staff. This plan which was detailed in SAI-COP's letter dated 18 March 1988 to Project Director identified the various activities required for succsfull implementation of computer assisted system operations plan and is presented on Exhibit III-1. In drawing up the action plan the system was studied as a whole, weaknesses in the system were identified and proposals framed taking cognizance of existing infrastructural facilities, communications, transport facilities, availability of personnel and data. Exhibits III-2 presents a Schematic Diagram for Giritale Scheme Water Management Operation as invisioned by the Consultant for improving the operation of the systems.

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18 March 1988

Mr. W.N.M. Botejue
Project Director
Irrigation Management Division
Bullers Road
Colombo 7

Subject : ISMP Operations

Dear Sir .

Thanks to the assistance cooperation received from the Deputy Director of Irrigation, Polonnaruwa Range and his staff we are able to present to IMD/ID for their review and evaluation of the outline of procedures for a preliminary action plan for the four Polonnaruwa ISMP schemes. One of the main objectives of ISMP is improved system operations. This preliminary action plan has been prepared after a study of present operating procedures, existing infrastructural facilities, availability of personnel, transport facilitios, communications, and availability of data and flow of information.

The main activities are :

1. Identification and Establishment of Field Operation Units and Sub-Units

Establishment of two-way Communications between Operations Centers and Field Operation Units

Updating of Issue Trees and Preparation of Schematic Water Distribution Diagrams.

Installation of Rain Gauge network

Establishing Control and Measuring Devices in Main and Branch Canals

Establishing Control and Measuring devices in Pilot Areas

Establishing Control and Measuring Devices in other D-Channels

Assessment of Canal Losses, Seepage and Percolation in fields

Establishment of a Meteorological Station at Polonnaruwa

Development of Computer Model

stablishing Control and Measuring Devices in F canals (other than Pilot Areas)

Refinement of System Operations

rief description of the above 12 activities are as follows

Item No. 1. Identification and Establishment of Field Operation Units and Sub-Units

It is envisaged that water management operations will be carried out through a network of Field Operation Units and Sub-Units. Technical Assistants will be in charge of Field Operation Units which will cover about 2000 ha of command area and will be assisted by Work Supervisors who will be in charge of Sub-Units covering about 100 ha, which are in accordance with Irrigation Department Circular NO. RW/GEN, dated 28 November 1980.

Proposed Water Management Operations Plan for Kaudulla Scheme (typical for all schemes) is presented as a schematic diagram on Exhibit I. The schematic diagram illustrates how information, instructions, and feedback will flow through the control network.

The locations of the Field Operations Units have been identified in consultation with Division I.E.'s taking into consideration the existing ID buildings, spatial distribution, access, proximity to Post Office/Sub-Post Office, and townships. Although most of these units are in ID premises, improvement to existing facilities and or construction of new offices or quarters may be necessary. Cost estimates are now under operation. Locations of the Field Operation Units are presented on Exhibit II, Operation Data and Control Network Plan.

Item No. 2. Establishment of two-way Communications between Operation Centers and Field Operation Units

This is the most important item which by itself could make an immediate impact not only on water management operations but also on other day to day activities of the Division.

It is presently envisioned that telephones will be located at Field Operation Units with the possibility of extension lines from existing Sub-Post Offices. Alternatives will be studied in consultation with Telecommunication Department and an estimate of cost will be presented in due course.

Item No. 3. Updating of "Issue Trees" and Preparation of a Schematic Water Distribution Diagrams

The "Issue Trees" need to be updated to reflect changes in the distributory system as well as the total cultivated area. This could best be carried out with the aid of the Final Colony Plans (4 chains to an inch) and Final Colony Supplementary Tenement Lists prepared by the Survey Department. A request to initiate action was addressed to DDI-Polonnaruwa on 2 March 1988.

The Schematic Water Distribution Diagram, which is a bulk water "Issue Tree" showing water distribution up to D-Canal off takes will facilitate computation of required issues to the D-Canals. The Schematic Water Distribution Diagram for Giritale Scheme is presently under preparation and the irrigated areas will be amended after completion of the updating of the "Issue Tree" for that scheme.

Item NO. 4. Installation of a Rain Gauge network

Availability of daily rainfall data at the Operation Centers will enable better utilization of effective rainfall thereby conserving water in the reservoirs. Most of this benefit could be derived prior to development of Computer Models and is dependent only on the proposed two-way communication system. Some thirteen locations for rain gauges have been identified and are shown on the Operation Data and Control Network Plan, Exhibit II. Cost estimates for these rain gauges will be forwarded to you by separate letter.

Item No. 5. Establishing Control and Measuring Devices in Main and Branch Canals

Identification of control and measuring points and the selection of the type of measuring device is to be carried out during the Operation Survey. Reservoir sluice and canal cross regulators are to be used as controls and are included in ES1. In most cases, existing structures are to be used for measurement and entails installation of gauges and rating of discharges by means of current meters, for completion in October 1988.

Item No. 6 Establishing Control and Measuring Devices in Pilot Areas.

Identification of control and measuring points and the selection of the type of measuring device is been carried out during the survey and design stage of the Pilot Area. Cost of the measuring devices are included in the Pilot Area cost estimates which are expected to be completed by 15 April 1988. If approved, the construction can commence in September 1988 and calibration in early 1989.

Item No. 7 Establishing Control and Measuring Devices in other D-Canals

Cast iron screw type lifting gates are to be installed or replaced, where necessary, and measuring devices will be installed at each D-Canal offtake during rehabilitation of the D-Canal. This work will continue throughout the project period.

Item No. 8 Assessment of Canal Losses, Seepage and Percolation in Fields (other than Pilot Areas)

Canal losses are to be ascertained after installation and calibration of measuring devices.

tative schedules for establishing canal losses are as follows :

Main and Branch canals - 1st quarter 1989

Pilot Areas - 2nd Quarter 1989

D & F Canals in other areas - to be continued to the end of the Project.

udies to assess canal losses have been conducted by the Irrigation ater Management Study at Kaudulla by Hydraulics Research - llingford 1978-85. Values for Maha and Yala are given separately r Stage I and Stage II areas under canal categories (A) Main and anch (B) Distributory and Field.

veral other studies have been conducted in Polonnaruwa District to sess seepage and percolation losses in the field and information om those studies will be utilized, where applicable, for ISMP.

hese studies are :

1985 - Diagnostic Analysis - W.M.S. Project

1986 - A study of Seepage and Percolation Rates in Rice Cultivation in the Polonnaruwa District of Sri Lanka. 1986. S.B. Smolnik and M.B. Riley, C.S.U.

1978-83 Irrigation Water Management Study at Kaudulla-Hydraulics Research - Wallingford, England

ditional studies in areas likely to exhibit unusual seepage and rcolation losses could be carried out during operation of the mputer Model.

## Item No. 9. Establishment of a Meteorological Station at Polonnaruwa

Presently there are two meteorological stations at Kaudulla established under the Irrigation Water Management Study and another at Aralanganwila in Mahaweli System B ( about 30 km South East of Polonnaruwa ) . In order to obtain reliable data for operation of the P.S.S and Giritale schemes it is proposed to establish a meteorological station at Polonnaruwa, location of which is shown in the annexed Operation Data and Control Network Plan (Exhibit I). The cost estimate for setting up this station will be intimated to you by a separate letter.

## Item No. 10. Development of Computer Model

Weekly operation model is to be based on Gal Oya L.B. Model which was developed in 1985-86. Since most of the data required for development of a model available for Kaudulla Scheme and it s proposed that the Kaudulla Model be given priority.

ith the introduction of computers, reservoir operation model an be developed using historical data which will greatly assist n deciding on cultivation extends during the Yala Season.

## Item No. 11. Setting up of control measuring devices in Field Canals (other than in Pilot Areas)

Location of control and measuring devices and the selection of types is to be carried out during survey and design stage of these canals and the construction of the devices will continue throughout the project period. However, preliminary estimates in the Pilot Areas indicate that the USAID agreed rates of reimbursement are insufficient to replicate the water measurement facilities as proposed in the Pilot Areas to the remainder of the 65,000 acres in the Polonnaruwa Range.

## Item No. 12. Refinement of System Operations

With the introduction of control and measuring devices in the D and F-Canals and availability of better data on water requirements, effective rainfall, canal losses, seepage and percolation losses and experience gained in operation of the computer model. the system operations will be refined during the life-of-Project.

The above twelve items are considered to be the major and essential items required in order to implement the improved water management and operations for the ISMP. Other requirements will be introduced during the course of the Life-of-Project as required to improve and refine the operations. A schedule of conducting these twelve major work items is presented on Exhibit III.

SHELADIA Associates, Inc.

would be appreciated if IMD/ID would review this preliminary
on plan, and provide us your comments as rapidly as possible in
r that this work can proceed in a timely and efficient manner.

erely.

ouis E Haley
ief-of-Party

nclosure : a/s

c w/cy encl :

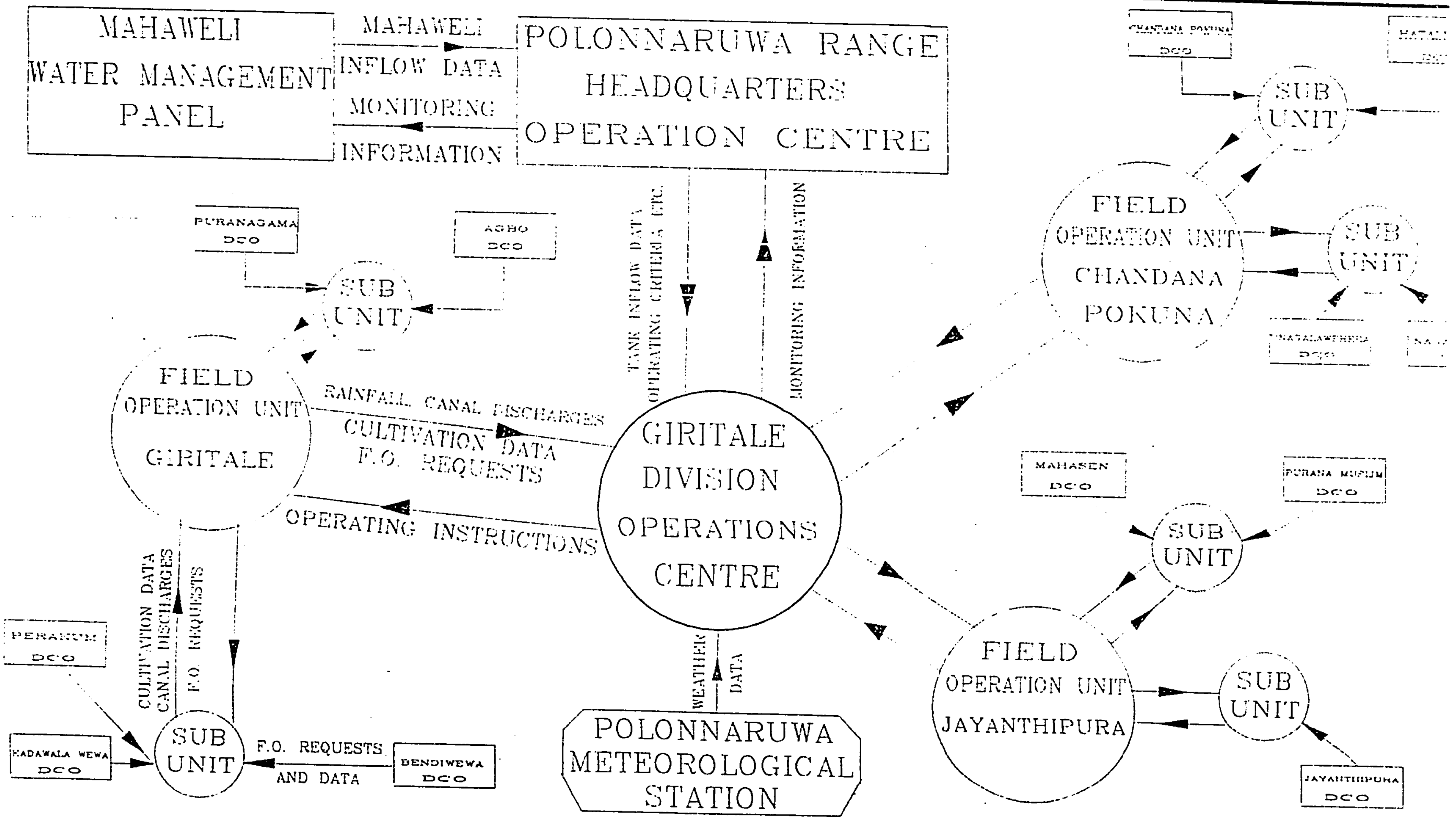
Mr. S Piyadasa, DDI-Polonnaruwa
Mr. L.T. Wijesuriya, ADD ISMP/ID
Mr S. Ranatunga, DD O&M/IMD
Mr. Dan Jenkins, USAID
Mr Dan Bradbury, SAI

## SYSTEM OPERATIONS-POLONNARUWA RANGE
## ACTIVITY SCHEDULE

| ITEM NO | ACTIVITY | 1988 | | | | 1989 | | | | 1990 | | | | 1991 | | | | 1992 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1st QTR | 2nd QTR | 3rd QTR | 4th QTR | 1st QTR | 2nd QTR | 3rd QTR | 4th QTR | 1st QTR | 2nd QTR | 3rd QTR | 4th QTR | 1st QTR | 2nd QTR | 3rd QTR | 4th QTR | 1st QTR | 2nd QTR | 3rd QTR | 4th QTR |
| 1 | Identification & establishment of Field Operation Units | - - | - - | - - | - - | - - | | | | | | | | | | | | | | | |
| 2 | Establishment of 2 way communications between Operation Centres & Field Operation Units | | | (1) | - - | — | — | — | | | | | | | | | | | | | |
| 3 | Updating of Issue trees and preparation of Schematic Water Distribution Diagrams | | — | — | — | | | | | | | | | | | | | | | | |
| 4 | Installation of rain gauge network | | | (1) | - - | — | — | | | | | | | | | | | | | | |
| 5 | Setting up of control and measuring devices in main and branch canals | | — | — | | | | | | | | | | | | | | | | | |
| 6 | Setting up of control and measuring devices in pilot areas | | | | — | — | | | | | | | | | | | | | | | |
| 7 | Setting up of control and measuring devices in other D canals | | | | | | | | — | — | | | — | — | | | — | — | | | |
| 8 | Assesment of canal losses, seepage & percolation in fields | | | | | — (2) | — | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | | |
| 9 | Establishment of a meteorological station at Polonnaruwa | | | (1) | - - | - - | — | | | | | | | | | | | | | | |
| 10 | Development of Computer models | | | | | — (3) | — | — (4) | — (5) | | | | | | | | | | | | |
| 11 | Setting up of control and measuring devices in F canals | | | | | | | | — | — | | | — | — | | | — | — | | | |
| 12 | Refinement of System operations | | | | | | | | | | | | | - - | - - | - - | - - | - - | - - | | |

NOTES: (1)- Approval of Estimates (2)- Main and branch pilot areas (3)- Kaudulla (4)- Giritale/Minneriya (5)- PSS

# GIRITALE SCHEME WATER MANAGEMENT OPERATIO



# CHAPTER IV.

## ACCOMPLISHMENTS TO DATE

Most of the activities identified in the Action Plan could not be achieved due to the very low priority given to the water management improvements program. The accomplishments to date are setout below:

As a result of operation surveys carried out in RBE Scheme and in the four Polonnaruwa Schemes locations and types of control and measuring devices considered adequate for effective control and monitoring of canal deliveries were identified. In the Gal Oya RB Scheme the measuring devices in the main canal and its off-takes were identified and proposals incorporated into the pragramatic rehabilitation estimates.

Control and Issue Diagrams (schematic water distribution diagrams with locations of control and monitoring points) were prepared for Giritale, PSS, Minneriya, Kaudulla, and RBE. Control and Issue Diagram of Giritale Scheme is presented on Exhibit IV-1.

Computers have been installed at the DDI's office in Polonnaruwa and at the IE's office at Polonnaruwa, Hingurakgoda, Kaudulla and Nikaweratiya.

The following Computer models have been developed and field tested.

- Reservoir Operations Model - For prereason planning and for establishing a rule curve for operating the reservoir during the season. A description of this model is given on Exhibit IV-2.

- Seasonal Water Report - For recording seasonal data and for evaluating the performance of the irrigation scheme as a whole. The Seasonal Water Report for Giritale Scheme in respect of Yala 88 and Maha 89 is on Exhibit IV-3.

- System Operation Model - For scheduling of canal deliveries taking into consideration such factors as extents actually cultivated, crops grown, crop staggers, stage of crop growth, soil properties, rainfall, canal losses, drainage inflows etc. The model also provides the management with an evaluation of the performance of the delivery system at each monitored point on a daily, weekly or periodic basis as required.

Technical Assistants have been trained on the job in the measurement of canal deliveries and procedures for calibration of measuring devices have been established.

Training in the use of micro-computers for water management has been given to Irrigation Engineers and Technical Assistants at Utah University and at Polonnaruwa.

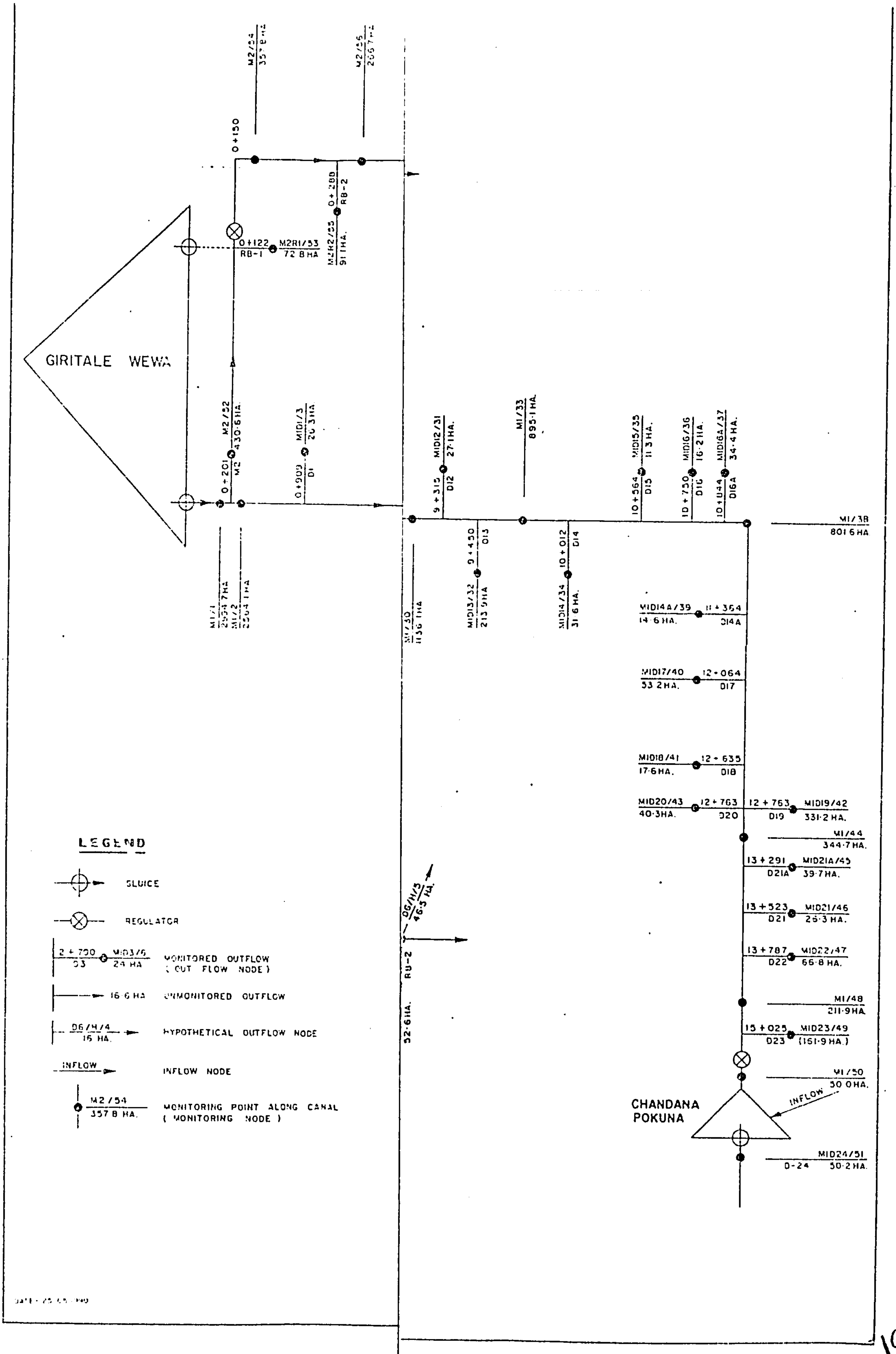
An attempt was made to implement computer assisted water scheduling in Giritale Scheme with a very limited number of monitoring points (9). A sample of the computer printouts obtained during this exercise are at the end of this chapter under Exhibit IV-4. The water management indices for these monitored points for the week 06 July - 12 July 1990 are less than unity, indicating that the actual releases are less than the calculated values. This is probably due to over estimation of on-farm losses (seepage and percolation).

Estimation of on-farm water requirements and an assessment of on-farm water requirements for low land paddy in Polonnaruwa was made based on Diyasenpura evapotranspiration data, probable monthly rainfall and average seepage and percolation values. The results are presented at the end of this chapter under Exhibit IV-5.

A program for computing the theoretical on-farm water requirements is incorporated in the Seasonal Water Report computer model. This program takes into account time of planting, number of staggers, percentage area in each stagger, land preparation period, land preparation water requirements and field losses.

Assessment of the costs of operation of the main and distributary system was developed by the System Operations Engineer during his assignment. In order to determine the magnitude of operation costs, an attempt was made to assess the operation costs of Giritale Scheme and the results are presented on Exhibit IV-6.

Rain gages have been installed in the four Polonnaruwa Schemes as envisaged in the Action Plan.


M2/54
357 8 HA
M2/55
266 7 HA
0+150
0+280
RB-2
0+122
RB-1
M2R1/53
72 8 HA
M2R2/55
91 1 HA.
GIRITALE WEWA
M2/52
430·6 HA.
0+201
M2
MID1/3
20 3 HA.
0+909
D1
M1/1
2954 7 HA
M1/2
2564 1 HA
M1/30
1156 1 HA
MID12/31
27·1 HA.
9+315
D12
M1/33
895·1 HA.
9+450
D13
MID13/32
213 9 HA
10+012
D14
MID14/34
31 6 HA.
MID15/35
11 3 HA.
10+564
D15
MID16/36
16·2 HA.
10+750
D16
MID16A/37
34·4 HA.
10+844
D16A
M1/38
801 6 HA.
MID14A/39
14·6 HA.
11+364
D14A
MID17/40
53 2 HA.
12+064
D17
MID18/41
17·6 HA.
12+635
D18
MID20/43
40·3 HA.
12+763
D20
12+763
D19
MID19/42
331·2 HA.
M1/44
344·7 HA.
13+291
D21A
MID21A/45
39·7 HA.
13+523
D21
MID21/46
26·3 HA.
13+787
D22
MID22/47
66·8 HA.
M1/48
211·9 HA.
15+025
D23
MID23/49
(151·9 HA.)
M1/50
50 0 HA.
INFLOW
CHANDANA
POKUNA
MID24/51
D-24
50·2 HA.
DG/H/3
46·5 HA.
RU-2
52·6 HA.
LEGEND
SLUICE
REGULATOR
2+700
D3
MID3/6
24 HA
MONITORED OUTFLOW
( OUT FLOW NODE )
16·6 HA
UNMONITORED OUTFLOW
D6/H/4
16 HA.
HYPOTHETICAL OUTFLOW NODE
INFLOW
INFLOW NODE
M2/54
357 8 HA.
MONITORING POINT ALONG CANAL
( MONITORING NODE )
DATE - 25 05 1990

# RESERVOIR OPERATION MODEL

## Objective No. 1

### Preseason Planning

Estimation of the probable extent of the command area that could be successfully cultivated during the season with the available water in the reservoir and anticipated catchment and augmentation inflows:

### Inputs

- Water level in reservoir and reference date.
- Crop selection criteria- extents under different crops expressed as percentages of the total extent cultivated under a particular sluice.
- Crop calenders and Kc values for each sluice.
- Number of staggers (max 3) and percentages in respect of rice & OFC.
- Augmentation supply (from Mahaweli in the case of Giritale, Kaudulla and Minneriya).
- Augmentation effeciency.
- Eo (open water evaporation rate - daily rate for each month).
- ETO (reference crop evapotranspiration rate- daily rate for each month).
- Probable monthly rainfall in catchment.
- Probable monthly rainfall in command area.
- Land preparation period - No of days.
- Land preparation requirements for paddy and OFC.
- Seepage and percolation rate in farms (for each sluice).
- Application efficency for OFC.
- Conveyance efficiency of the distributary system (for each sluice).

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## Output

- Maximum probable extent which could be successfully cultivated under each sluice with each set or combination of cropping data.

This information could be the basis for ID recommendations at the Kanna Meeting, presenting the farmers with various alternatives based on pre- kanna meeting discussions with farmers.

## Assumptions Made

1. Extent of land to be cultivated during the season, expressed as a percentage of the total command area under the sluice, is the same for all sluices.

2. Seepage and percolation rate for paddy is the average rate applicable to the entire extent under that particular sluice.

3. Conveyance losses in the canal system expressed as a conveyance efficiency factor

## Basis of Computation

### Reservoir Inflows

a) Inflow from direct rainfall on reservoir
Monthly inflow = Surface Area x Probable monthly rainfall

b) Catchment inflow
As stream flow records are not available catchment inflow is calculated as follows:
Monthly inflow
= Catchment area x probable monthly rainfall x C

C = run-off coefficient
C is obtained from iso-yield curves (prepared by ID)

c) Augmentation inflow - Obtained from Mahaweli Authority's Seasonal Operation Plan. A conveyance efficiency factor is used to account for the losses between the point of measurement and the reservoir.

### Reservoir Losses

### EVAPORATION LOSS FROM RESERVOIR

Evaporation loss from reservoir = Surface Area x EO
EO = Open water evaporation

Due to lack of reliable data, Kaudulla data for the period 1978-83 measured at the High level sluice site and reported in Irrigation Water Management Study at Kaudulla - Report No. OD 66 by Hydraulic Research are used for all the reservoirs in Polonnaruwa Range.

| Month | EO in mm | |
|---|---|---|
| | Monthly | Daily |
| Apr | 214.8 | 7.16 |
| May | 232.6 | 7.50 |
| Jun | 252.4 | 8.41 |
| Jul | 256.8 | 8.28 |
| Aug | 278.8 | 8.99 |
| Sep | 242.0 | 8.07 |
| Oct | 196.6 | 6.34 |
| Nov | 140.6 | 4.69 |
| Dec | 133.6 | 4.31 |
| Jan | 161.4 | 5.21 |
| Feb | 174.2 | 6.22 |
| Mar | 218.4 | 7.05 |

## SEEPAGE AND PERCOLATION LOSSES FROM RESERVOIR

In the case of Kaudulla the loss from seepage and percolation has been estimated as 4.2 mm per day (over the surface area) by Hydraulic Research from water balance studies, vide Irrigation Water Management at Kaudulla - Report OD 70, July 1985. This is very much higher than the value obtained from the I.D. norm of 0.5% of the volume per month.

Studies of Parakrama Samudra by the Consultants during the 1988 March - April close season indicated losses very much higher than those given by the ID norm or those of Hydraulic Research. High losses in Parakrama Samudra may by due to the comparatively long embankment.

In view of the above seepage and percolation losses in Parakrama Samudra and Kaudulla reservoirs are to be taken as 4.2 mm/day. Losses through Giritale and Minneriya reservoirs are to be taken as 0.5 % of the gross storage volume per month.

## Reservoir Releases

Releases from each sluice is computed daily taking into account.

1) Staggered cultivation of each crop.

2) Monthly variation of ET0 (constant daily rate during the month).

3) Kc values for the growth stages for each crop.

4) Seepage and percolation rate in paddy areas (assumed constant throughout the crop stage).

5) Variation in field losses in the case of OFC
(ET0 xKc)x(1/Ea-1) Ea=application efficiency
6) Conveyance losses in the canal system expressed as a conveyance efficiency factor.

## Objective No. 2.

Evaluation of reservoir performance during the season and estimation of shortfalls or reduction in issues if and when necessary.

At the commencement of water issues the model could be run with the actual extents to be cultivated as inputs and a rule-curve plotted for the season. If at any time during the season the reservoir water level recedes below the level indicated by the rule-curve, the shortfall could be estimated or the required reduction of issues determined.

# GIRITALE TANK

## RESERVOIR OPERATION STUDY

### MONTHLY INFLOWS INTO RESERVOIR

a) Catchment inflows
Catchment Area = 24.3 sq.KM
Runoff coefficients Maha 0.257 , Yala 0.075 (from reservoir data file)
Run off for 1 mm of rainfall
Maha 0.257x24.3x1000 = 6245 $M^3$
Yala 0.075x24.3x1000 = 1822 $M^3$

b) Inflow due to direct rainfall on reservoir

= Surface Area ($M^2$) x 75% probable rainfall (mm)x 1/1000

75% probability rain fall (from Table 2.3 Design of headworks for small catchments) and monthly inflows are as follows:

| Season | Month | 75% probable rainfall mm | Catchment runoff $M^3$ x1000 | Effective Rainfall mm | Direct Rainfall |
|---|---|---|---|---|---|
| | Apr | 127 | 231.4 | 68 | 0.127 A |
| | May | 51 | 92.9 | 17 | 0.051 A |
| YALA | Jun | 13 | 23.7 | 0 | 0.013 A |
| | Jul | 0 | 0 | 0 | 0.0 |
| | Aug | 13 | 23.7 | 0 | 0.013 A |
| | Sept | 25 | 45.5 | 0 | 0.025 A |
| | Oct | 127 | 793.1 | 68 | 0.127 A |
| | Nov | 152 | 949.2 | 85 | 0.152 A |
| MAHA | Dec | 127 | 793.1 | 68 | 0.127 A |
| | Jan | 76 | 747.6 | 34 | 0.076 A |
| | Feb | 25 | 156.1 | 0 | 0.025 A |
| | Mar | 51 | 318.5 | 17 | 0.051 A |

c) Augmentation inflows
To be obtained from Mahaweli Seasonal Operation Plan.

### SEEPAGE AND PERCOLATION LOSSES

Monthly loss taken as 0.5% of storage at beginning of month.

### EVAPORATION LOSS

Evaporation loss = Surface area (at beginning of month) x Eo
Eo = open water evaporation (monthly)

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## RESERVOIR RELEASES

Monthly requirements (from on - farm water requirements file) ar as follows:

Yala.

| Month | APR. | MAY | JUN. | JLY. | AUG. |
|---|---|---|---|---|---|
| Release<br>$M^3$/Ha | 696 | 4154 | 5322 | 5513 | 2312 |

MAHA

| MONTH | OCT. | NON. | DEC. | JAN. | FEB. | MAR. |
|---|---|---|---|---|---|---|
| Release<br>$M^3$/Ha | 701 | 2488 | 2878 | 3771 | 4135 | 2094 |

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# GIRITALE RESERVOIR

## Data

| | |
|---|---|
| F. S. L. | 13.00 M |
| Minimum draw dawn level (M. D. L) | 2.94 M |

No of sluices 2 (L. B and R.B)

Presently only R.B. Sluice is in operation

Command area 3035 Ha

1988 Yala cultivation data

| | |
|---|---|
| First day of water issue | 01.05.88 |
| Water level on 1.5.88 | 11.20 M |
| Extent cultivated | 1619 Ha |
| Crops 100 % paddy | |
| Last day of water issue | 26/8/88 |
| Water level on 26/8/88 | 6.40 M |

Rainfall in mm

| May | June | July | Aug |
|---|---|---|---|
| 33 | --- | 125 | 38 |

GTLRESVO.DSK

Irrigation Systems Management Project

Irrigation Department

Polonnaruwa Range

Hingurakgoda Division

# Seasonal Water Report

Giritale Scheme
Yala 1988

Date :-06/07/89

# Seasonal Water Report

| | |
|---|---|
| Season | Yala 1988 |
| Name of Reservoir | Giritale |
| Gross Storage Capacity in 1000M^3 | 24331.7 |
| Irrigable extent under specification (Ha) | 2509.0 |
| Present Irrigable Extent (ha) | 3035.0 |
| Reservoir height at commencement of water issue in meters | 11.2 |
| Anticipated seasonal inflow from Mahaweli System (Dry) 1000M^3 | 23100.0 |
| Anticipated seasonal inflow from Mahaweli System (Ave) 1000M^3 | 22100.0 |
| Seasonal inflow received from Mahaweli System (ID) 1000M^3 | 29434.7 |
| Seasonal inflow received from Mahaweli System (MASL) 1000m^3 | 25500.0 |

Cultivation dates and extents as per decisions taken at Kanna meeting held on 19/04/88 are as follows.

| Item | Agreed | Actual | Remarks |
|---|---|---|---|
| Extent Cultivated (total) | 1530.0 Ha | 1619.0 Ha | |
| Paddy variety :-95 days | 1530.0 Ha | 1619.0 Ha | |
| O.F.C | 0.0 Ha | 0.0 Ha | |
| Date of first issue of water | 01/05/88 | 01/05/88 | |
| Date of last water issue | 20/08/88 | 26/08/88 | |
| Last date for broadcasting | 21/05/88 | 21/05/88 | |
| Last date for transplanting | / / | / / | Not Available |
| Last date for harvesting | 10/09/88 | 20/09/88 | |

## Cultivation

| | |
|---|---|
| Extent Cultivated as a percentage of area under specification | 64.5 |
| Extent successfully harvested (Ha) | 1619.0 |
| Percentage of cultivation success | 100.0 |
| Average estimated yield (T/Ha) | 4.5 |

## Water Issue

| | | |
|---|---|---|
| Water issues to Main Canal | 1000M^3 | 25700.0 |
| Total Water Issues | 1000M^3 | 25700.0 |
| Main Canal Duty (excluding ER) | (M) | 1.59 |
| Scheme Duty (excluding ER) | (M) | 1.59 |
| Rainfall during the season | (mm) | 196.0 |
| Estimated effective rainfall (ER) during the season | (mm) | 81.6 |
| Main canal duty inclding ER | (M) | 1.67 |
| Scheme duty including ER | (M) | 1.67 |
| Average yield per unit of water used | (Kg/M^3) | 0.27 |
| * Calculated field water requirement | (M) | 1.31 |
| Calculated field irrigation requirement | (M) | 1.22 |
| Canal system conveyance efficiency | % | 0.77 |

* Basis of calculation

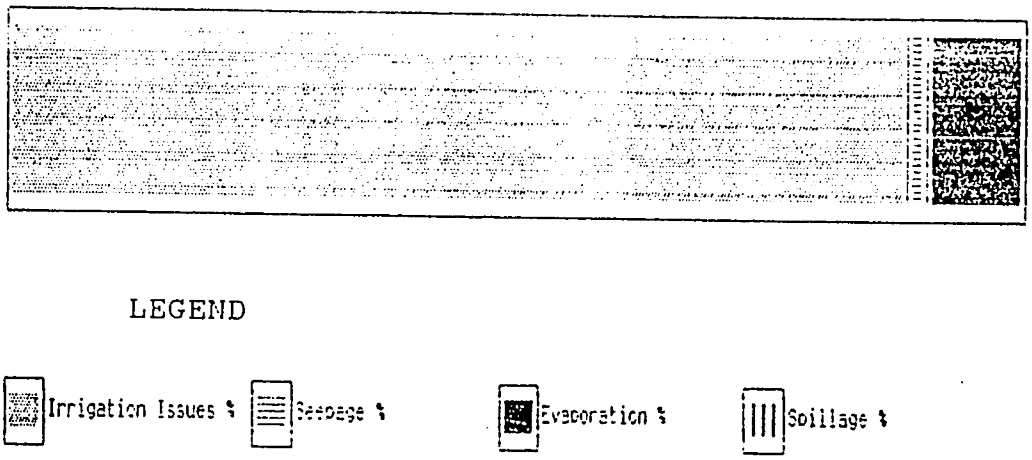
Number of staggers : 2
Percentage area under stagger 1 : 50
Percentage area under stagger 2 : 50
Land preparation period (days) : 14
Land preparation water requirement (mm) : 178
Seepage and percolation rate (mm/day) : 5

## Reservoir Water Balance

| | |
|---|---|
| Yield from catchment (1000M^3) | 357.1 |
| Total Inflow (1000M^3)<br>(Catchment yield + Augmentation Supply) | 29791.9 |
| Change in storage (1000M^3) | -12144.6 |
| Issues for Irrigation (1000M^3) | 39065.4 |
| Issues as measured from sluice discharges (1000M^3) | 25700.0 |

| Item | Value | Percentage |
|---|---|---|
| Irrgation Issues | 25700 | 90 |
| Seepage | 270 | 1 |
| Evaporation | 2601 | 9 |
| Spillage | 0 | 0 |

## Reservoir Water Balance



## RESERVOIR PERFORMANCE

| Date | Water Level (M) | Water Surface Area (Ha) | Capacity (1000M^3) | Discharege from Sluice (1000M^3) | Spillage (1000M^3) | Estimated Evaporation Loss (1000M^3) | Estimated Seepage & Percolation Loss (1000^M3) | Augmentation Supply (1000M^3) | Weighted Rainfall in Catchment (mm) |
|---|---|---|---|---|---|---|---|---|---|
| 01/05/88 | 11.2 | 295.3 | 18417.7 | 360.0 | 0.0 | 22.1 | 3.0 | 518.4 | 0.00 |
| 02/05/88 | 11.2 | 295.3 | 18417.7 | 360.0 | 0.0 | 22.1 | 3.0 | 518.4 | 0.00 |
| 03/05/88 | 11.2 | 295.3 | 18417.7 | 360.0 | 0.0 | 22.1 | 3.0 | 518.4 | 0.00 |
| 04/05/88 | 11.2 | 295.3 | 18417.7 | 360.0 | 0.0 | 22.1 | 3.0 | 518.4 | 0.00 |
| 05/05/88 | 11.3 | 296.6 | 18759.6 | 360.0 | 0.0 | 22.2 | 3.1 | 518.4 | 0.00 |
| 06/05/88 | 11.3 | 296.6 | 18759.6 | 360.0 | 0.0 | 22.2 | 3.1 | 518.4 | 0.00 |
| 07/05/88 | 11.4 | 297.9 | 19101.5 | 360.0 | 0.0 | 22.3 | 3.1 | 518.4 | 0.00 |
| 08/05/88 | 11.4 | 297.9 | 19101.5 | 360.0 | 0.0 | 22.3 | 3.1 | 705.8 | 0.00 |
| 09/05/88 | 11.4 | 297.9 | 19101.5 | 360.0 | 0.0 | 22.3 | 3.1 | 879.5 | 0.00 |
| 10/05/88 | 11.5 | 299.3 | 19443.4 | 360.0 | 0.0 | 22.4 | 3.2 | 625.5 | 0.00 |
| 11/05/88 | 11.5 | 300.6 | 19785.2 | 360.0 | 0.0 | 22.5 | 3.3 | 520.1 | 0.00 |
| 12/05/88 | 11.5 | 299.3 | 19443.4 | 360.0 | 0.0 | 22.4 | 3.2 | 439.7 | 0.00 |
| 13/05/88 | 11.5 | 299.3 | 19443.4 | 360.0 | 0.0 | 22.4 | 3.2 | 298.0 | 0.00 |
| 14/05/88 | 11.5 | 299.3 | 19443.4 | 360.0 | 0.0 | 22.4 | 3.2 | 486.4 | 0.00 |
| 15/05/88 | 11.5 | 299.3 | 19443.4 | 360.0 | 0.0 | 22.4 | 3.2 | 398.3 | 0.00 |
| 16/05/88 | 11.5 | 299.3 | 19443.4 | 360.0 | 0.0 | 22.4 | 3.2 | 437.1 | 0.00 |
| 17/05/88 | 11.4 | 299.3 | 19443.4 | 360.0 | 0.0 | 22.4 | 3.2 | 327.2 | 0.00 |
| 18/05/88 | 11.4 | 297.9 | 19101.5 | 360.0 | 0.0 | 22.3 | 3.1 | 127.0 | 0.00 |
| 19/05/88 | 11.3 | 296.6 | 18759.6 | 0.0 | 0.0 | 22.2 | 3.1 | 48.3 | 60.15 |
| 20/05/88 | 11.3 | 296.6 | 18759.6 | 360.0 | 0.0 | 22.2 | 3.1 | 0.0 | 0.00 |
| 21/05/88 | 11.2 | 295.3 | 18417.7 | 360.0 | 0.0 | 22.1 | 3.0 | 57.8 | 0.00 |
| 22/05/88 | 11.1 | 294.0 | 18075.8 | 360.0 | 0.0 | 22.0 | 3.0 | 56.1 | 0.00 |
| 23/05/88 | 11.0 | 292.7 | 17733.9 | 360.0 | 0.0 | 21.9 | 2.9 | 53.5 | 0.00 |
| 24/05/88 | 10.9 | 291.2 | 17390.6 | 360.0 | 0.0 | 21.8 | 2.8 | 95.5 | 0.00 |
| 25/05/88 | 10.7 | 289.6 | 17049.1 | 360.0 | 0.0 | 21.7 | 2.8 | 65.6 | 0.00 |
| 26/05/88 | 10.7 | 288.1 | 16737.3 | 140.0 | 0.0 | 21.6 | 2.7 | 37.2 | 0.00 |
| 27/05/88 | 10.6 | 286.5 | 16425.6 | 140.0 | 0.0 | 21.4 | 2.7 | 30.3 | 0.00 |
| 28/05/88 | 10.6 | 286.5 | 16425.6 | 140.0 | 0.0 | 21.4 | 2.7 | 60.4 | 0.00 |
| 29/05/88 | 10.5 | 286.5 | 16425.6 | 140.0 | 0.0 | 21.4 | 2.7 | 63.0 | 0.00 |
| 30/05/88 | 10.5 | 285.0 | 16113.8 | 300.0 | 0.0 | 21.3 | 2.6 | 9.5 | 0.00 |
| 31/05/88 | 10.4 | 283.4 | 15802.1 | 300.0 | 0.0 | 21.2 | 2.6 | 0.0 | 0.00 |
| 01/06/88 | 10.3 | 281.8 | 15490.3 | 360.0 | 0.0 | 23.7 | 2.5 | 0.0 | 0.00 |
| 02/06/88 | 10.2 | 280.3 | 15178.5 | 360.0 | 0.0 | 23.5 | 2.5 | 12.1 | 0.00 |
| 03/06/88 | 10.1 | 278.7 | 14866.8 | 0.0 | 0.0 | 23.4 | 2.4 | 63.0 | 0.00 |
| 04/06/88 | 10.1 | 278.7 | 14866.8 | 0.0 | 0.0 | 23.4 | 2.4 | 77.7 | 0.00 |
| 05/06/88 | 10.1 | 278.7 | 14866.8 | 0.0 | 0.0 | 23.4 | 2.4 | 89.8 | 0.00 |
| 06/06/88 | 10.1 | 278.7 | 14866.8 | 360.0 | 0.0 | 23.4 | 2.4 | 89.8 | 0.00 |
| 07/06/88 | 10.0 | 276.8 | 14502.7 | 390.0 | 0.0 | 23.2 | 2.4 | 6.9 | 0.00 |
| 08/06/88 | 9.8 | 274.9 | 14241.3 | 390.0 | 0.0 | 23.1 | 2.3 | 0.0 | 0.00 |
| 09/06/88 | 9.6 | 271.1 | 13718.4 | 300.0 | 0.0 | 22.8 | 2.2 | 0.0 | 0.00 |
| 10/06/88 | 9.5 | 269.2 | 13457.0 | 0.0 | 0.0 | 22.6 | 2.2 | 72.5 | 0.00 |
| 11/06/88 | 9.5 | 269.2 | 13457.0 | 0.0 | 0.0 | 22.6 | 2.2 | 97.6 | 0.00 |
| 12/06/88 | 9.5 | 269.2 | 13457.0 | 0.0 | 0.0 | 22.6 | 2.2 | 97.6 | 0.00 |
| 13/06/88 | 9.5 | 267.3 | 13195.5 | 390.0 | 0.0 | 22.4 | 2.2 | 139.1 | 0.00 |
| 14/06/88 | 9.6 | 271.1 | 13718.4 | 370.0 | 0.0 | 22.8 | 2.2 | 419.9 | 0.00 |

# RESERVOIR PERFORMANCE

| Date | Water Level (M) | Water Surface Area (Ha) | Capacity (1000M^3) | Discharege from Sluice (1000M^3) | Spillage (1000M^3) | Estimated Evaporation Loss (1000M^3) | Estimated Seepage & Percolation Loss (1000^M3) | Augmentation Supply (1000M^3) | Weighted Rainfall in Catchment (mm) |
|---|---|---|---|---|---|---|---|---|---|
| 15/06/88 | 9.2 | 263.6 | 12672.6 | 370.0 | 0.0 | 22.1 | 2.1 | 439.7 | 0.00 |
| 16/06/88 | 9.2 | 261.7 | 12411.2 | 180.0 | 0.0 | 22.0 | 2.0 | 449.2 | 0.00 |
| 17/06/88 | 9.2 | 263.6 | 12672.6 | 0.0 | 0.0 | 22.1 | 2.1 | 393.1 | 0.00 |
| 18/06/88 | 9.3 | 265.4 | 12934.1 | 0.0 | 0.0 | 22.3 | 2.1 | 502.8 | 0.00 |
| 19/06/88 | 9.4 | 265.4 | 12934.1 | 0.0 | 0.0 | 22.3 | 2.1 | 466.5 | 0.00 |
| 20/06/88 | 9.6 | 269.2 | 13457.0 | 390.0 | 0.0 | 22.6 | 2.2 | 432.0 | 0.00 |
| 21/06/88 | 9.5 | 269.2 | 13457.0 | 300.0 | 0.0 | 22.6 | 2.2 | 407.8 | 0.00 |
| 22/06/88 | 9.4 | 267.3 | 13195.5 | 290.0 | 0.0 | 22.4 | 2.2 | 432.0 | 0.00 |
| 23/06/88 | 9.4 | 267.3 | 13195.5 | 0.0 | 0.0 | 22.4 | 2.2 | 383.6 | 0.00 |
| 24/06/88 | 9.5 | 269.2 | 13457.0 | 0.0 | 0.0 | 22.6 | 2.2 | 407.8 | 0.00 |
| 25/06/88 | 9.6 | 271.1 | 13718.4 | 130.0 | 0.0 | 22.8 | 2.2 | 554.6 | 0.00 |
| 26/06/88 | 9.6 | 271.1 | 13718.4 | 130.0 | 0.0 | 22.8 | 2.2 | 552.1 | 0.00 |
| 27/06/88 | 9.6 | 271.1 | 13718.4 | 360.0 | 0.0 | 22.8 | 2.2 | 489.3 | 0.00 |
| 28/06/88 | 9.6 | 269.2 | 13457.0 | 390.0 | 0.0 | 22.6 | 2.2 | 652.3 | 0.00 |
| 29/06/88 | 9.5 | 269.2 | 13457.0 | 360.0 | 0.0 | 22.6 | 2.2 | 657.5 | 0.00 |
| 30/06/88 | 9.5 | 267.3 | 13195.5 | 0.0 | 0.0 | 22.4 | 2.2 | 532.2 | 0.00 |
| 01/07/88 | 9.5 | 269.2 | 13457.0 | 0.0 | 0.0 | 22.3 | 2.2 | 517.5 | 0.00 |
| 02/07/88 | 9.6 | 271.1 | 13718.4 | 110.0 | 0.0 | 22.4 | 2.2 | 425.0 | 0.00 |
| 03/07/88 | 9.6 | 271.1 | 13718.4 | 110.0 | 0.0 | 22.4 | 2.2 | 396.5 | 109.32 |
| 04/07/88 | 9.7 | 273.0 | 13979.8 | 90.0 | 0.0 | 22.6 | 2.3 | 119.2 | 0.00 |
| 05/07/88 | 9.7 | 273.0 | 13979.8 | 90.0 | 0.0 | 22.6 | 2.3 | 0.0 | 60.13 |
| 06/07/88 | 9.7 | 273.0 | 13979.8 | 90.0 | 0.0 | 22.6 | 2.3 | 0.0 | 3.64 |
| 07/07/88 | 9.7 | 273.0 | 13979.8 | 90.0 | 0.0 | 22.6 | 2.3 | 0.0 | 14.58 |
| 08/07/88 | 9.7 | 271.1 | 13718.4 | 90.0 | 0.0 | 22.4 | 2.2 | 0.0 | 40.08 |
| 09/07/88 | 9.7 | 271.1 | 13718.4 | 90.0 | 0.0 | 22.4 | 2.2 | 139.1 | 0.00 |
| 10/07/88 | 9.7 | 271.1 | 13718.4 | 90.0 | 0.0 | 22.4 | 2.2 | 116.6 | 0.00 |
| 11/07/88 | 9.6 | 271.1 | 13718.4 | 90.0 | 0.0 | 22.4 | 2.2 | 104.5 | 0.00 |
| 12/07/88 | 9.6 | 271.1 | 13718.4 | 360.0 | 0.0 | 22.4 | 2.2 | 24.1 | 0.00 |
| 13/07/88 | 9.4 | 265.4 | 12934.1 | 360.0 | 0.0 | 21.9 | 2:1 | 0.0 | 0.00 |
| 14/07/88 | 9.2 | 261.7 | 12411.2 | 340.0 | 0.0 | 21.6 | 2.0 | 41.4 | 0.00 |
| 15/07/88 | 9.0 | 259.5 | 12126.7 | 0.0 | 0.0 | 21.4 | 2.0 | 116.6 | 0.00 |
| 16/07/88 | 9.0 | 259.5 | 12126.7 | 0.0 | 0.0 | 21.4 | 2.0 | 148.6 | 0.00 |
| 17/07/88 | 9.0 | 259.5 | 12126.7 | 0.0 | 0.0 | 21.4 | 2.0 | 143.4 | 0.00 |
| 18/07/88 | 9.0 | 259.5 | 12126.7 | 140.0 | 0.0 | 21.4 | 2.0 | 141.7 | 0.00 |
| 19/07/88 | 8.9 | 257.3 | 11896.3 | 340.0 | 0.0 | 21.3 | 1.9 | 239.3 | 0.00 |
| 20/07/88 | 8.8 | 255.1 | 11665.8 | 340.0 | 0.0 | 21.1 | 1.9 | 280.8 | 0.00 |
| 21/07/88 | 8.7 | 252.9 | 11435.4 | 330.0 | 0.0 | 20.9 | 1.9 | 244.5 | 0.00 |
| 22/07/88 | 8.6 | 248.4 | 10974.5 | 0.0 | 0.0 | 20.5 | 1.8 | 310.1 | 0.00 |
| 23/07/88 | 8.6 | 248.4 | 10974.5 | 0.0 | 0.0 | 20.5 | 1.8 | 490.7 | 0.00 |
| 24/07/88 | 8.6 | 250.7 | 11205.0 | 120.0 | 0.0 | 20.7 | 1.8 | 808.7 | 0.00 |
| 25/07/88 | 8.7 | 252.9 | 11435.4 | 120.0 | 0.0 | 20.9 | 1.9 | 681.7 | 0.00 |
| 26/07/88 | 8.8 | 252.9 | 11435.4 | 340.0 | 0.0 | 20.9 | 1.9 | 796.6 | 0.00 |
| 27/07/88 | 8.9 | 255.1 | 11665.3 | 340.0 | 0.0 | 21.1 | 1.9 | 486.4 | 0.00 |
| 28/07/88 | 8.9 | 255.1 | 11665.8 | 340.0 | 0.0 | 21.1 | 1.9 | 290.3 | 0.00 |
| 29/07/88 | 8.8 | 252.9 | 11435.4 | 0.0 | 0.0 | 20.9 | 1.9 | 307.5 | 0.00 |

RESERVOIR PERFORMANCE

| Date | Water Level (M) | Water Surface Area (Ha) | Capacity (1000M^3) | Discharege from Sluice (1000M^3) | Spillage (1000M^3) | Estimated Evaporation Loss (1000M^3) | Estimated Seepage & Percolation Loss (1000^M3) | Augmentation Supply (1000M^3) | Weighted Rainfall in Catchment (mm) |
|---|---|---|---|---|---|---|---|---|---|
| 30/07/88 | 8.9 | 255.1 | 11665.8 | 0.0 | 0.0 | 21.1 | 1.9 | 344.7 | 0.00 |
| 31/07/88 | 8.9 | 257.3 | 11896.3 | 140.0 | 0.0 | 21.3 | 1.9 | 896.8 | 0.00 |
| 01/08/88 | 9.0 | 259.5 | 12126.7 | 140.0 | 0.0 | 23.3 | 2.0 | 495.9 | 0.00 |
| 02/08/88 | 9.0 | 259.5 | 12126.7 | 360.0 | 0.0 | 23.3 | 2.0 | 128.7 | 0.00 |
| 03/08/88 | 8.9 | 257.3 | 11896.3 | 350.0 | 0.0 | 23.1 | 1.9 | 151.2 | 0.00 |
| 04/08/88 | 8.8 | 252.9 | 11435.4 | 340.0 | 0.0 | 22.7 | 1.9 | 60.4 | 0.00 |
| 05/08/88 | 8.7 | 250.7 | 11205.0 | 0.0 | 0.0 | 22.5 | 1.8 | 139.1 | 0.00 |
| 06/08/88 | 8.6 | 248.4 | 10974.5 | 0.0 | 0.0 | 22.3 | 1.8 | 160.7 | 69.24 |
| 07/08/88 | 8.6 | 250.7 | 11205.0 | 0.0 | 0.0 | 22.5 | 1.8 | 158.1 | 0.00 |
| 08/08/88 | 8.6 | 250.7 | 11205.0 | 140.0 | 0.0 | 22.5 | 1.8 | 175.3 | 0.00 |
| 09/08/88 | 8.6 | 248.4 | 10974.5 | 390.0 | 0.0 | 22.3 | 1.8 | 97.6 | 0.00 |
| 10/08/88 | 8.4 | 244.0 | 10513.7 | 390.0 | 0.0 | 21.9 | 1.7 | 69.1 | 0.00 |
| 11/08/88 | 8.5 | 246.2 | 10744.1 | 360.0 | 0.0 | 22.1 | 1.7 | 0.0 | 0.00 |
| 12/08/88 | 8.1 | 236.6 | 9806.3 | 0.0 | 0.0 | 21.2 | 1.6 | 0.0 | 0.00 |
| 13/08/88 | 8.0 | 234.2 | 9583.1 | 0.0 | 0.0 | 21.0 | 1.6 | 41.4 | 0.00 |
| 14/08/88 | 8.0 | 234.2 | 9583.1 | 140.0 | 0.0 | 21.0 | 1.6 | 53.5 | 0.00 |
| 15/08/88 | 7.9 | 231.4 | 9359.5 | 140.0 | 0.0 | 20.8 | 1.5 | 77.7 | 0.00 |
| 16/08/88 | 7.7 | 228.3 | 9135.8 | 360.0 | 0.0 | 20.5 | 1.5 | 19.0 | 0.00 |
| 17/08/88 | 7.5 | 223.5 | 8688.5 | 360.0 | 0.0 | 20.1 | 1.4 | 0.0 | 0.00 |
| 18/08/88 | 7.3 | 218.3 | 8241.2 | 240.0 | 0.0 | 19.6 | 1.3 | 0.0 | 0.00 |
| 19/08/88 | 7.2 | 215.1 | 7980.0 | 0.0 | 0.0 | 19.3 | 1.3 | 65.6 | 0.00 |
| 20/08/88 | 7.2 | 215.1 | 7980.0 | 0.0 | 0.0 | 19.3 | 1.3 | 35.5 | 0.00 |
| 21/08/88 | 7.2 | 215.1 | 7980.0 | 120.0 | 0.0 | 19.3 | 1.3 | 35.5 | 0.00 |
| 22/08/88 | 7.1 | 212.6 | 7792.3 | 120.0 | 0.0 | 19.1 | 1.3 | 75.1 | 0.00 |
| 23/08/88 | 7.0 | 210.3 | 7604.6 | 360.0 | 0.0 | 18.8 | 1.2 | 1.7 | 0.00 |
| 24/08/88 | 6.8 | 204.9 | 7229.2 | 360.0 | 0.0 | 18.4 | 1.2 | 0.0 | 0.00 |
| 25/08/88 | 6.4 | 192.2 | 6290.7 | 330.0 | 0.0 | 17.2 | 1.0 | 0.0 | 0.00 |
| 26/08/88 | 6.4 | 192.2 | 6290.7 | 330.0 | 0.0 | 17.2 | 1.0 | 183.1 | 0.00 |
| 27/08/88 | 6.3 | 191.9 | 6273.1 | 0.0 | 0.0 | 17.2 | 1.0 | 133.9 | 0.00 |
| Totals | | | | 25700.0 | 0.0 | 2630.7 | 270.3 | 29434.7 | 357.11 |

Irrigation Systems Management Project

Irrigation Department

Polonnaruwa Range

Hingurakgoda Division

# Seasonal Water Report

Giritale Scheme

Maha 1989

Date :-19/07/90

## GIRITALE SCHEME
## HINGURAKGODA DIVISION

### Daily Water Delivery Requirements

O&M Week: 12 · Date: 09-Jul-90 Season: Yala

| Node Label | US Branch Node Label | Node Type | Flow Depth (m) | Flow Rate (l/s) | Volume (m3) |
|---|---|---|---|---|---|
| M1/1 | M1/1 | Monitor | 0.767 | 3971 | --- |
| M1/2 | M1/1 | Monitor | 0.754 | 3447 | --- |
| M1/5 | M1/1 | Monitor | 0.933 | 3278 | --- |
| M1/7 | M1/1 | Monitor | 0.927 | 3245 | --- |
| M1/25 | M1/1 | Monitor | 0.616 | 1773 | --- |
| M1/27 | M1/1 | Monitor | 0.607 | 1727 | --- |
| M1/30 | M1/1 | Monitor | 0.521 | 1411 | --- |
| M1/33 | M1/1 | Monitor | 0.489 | 1083 | --- |
| M1/38 | M1/1 | Monitor | 0.504 | 947 | --- |

Beginning of Water Balance: 09-Jul-90

## DIYASENAPURA PENMAN ET. mm

| YEAR | APR | MAY | JUN | JLY | AUG | SEP | YALA TOTAL | OCT | NOV | DEC | JAN | FEB | MAR | MAHA TOTAL | TOTAL ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1978/79 | 160 | 179 | 199 | 197 | 209 | 202 | 1146 | 165 | 124 | 112 | 129 | 130 | 163 | 823 | 1969 |
| 1979/80 | 178 | 195 | 228 | 218 | 221 | 162 | 1202 | 153 | 111 | 107 | 117 | 137 | 162 | 787 | 1989 |
| 1980/81 | 145 | 183 | 195 | 215 | 208 | 202 | 1148 | 148 | 107 | 109 | 119 | 119 | 159 | 761 | 1909 |
| 1981/82 | 156 | 175 | 190 | 172 | 218 | 172 | 1083 | 161 | 121 | 110 | 130 | 142 | 167 | 831 | 1914 |
| 1982/83 | 170 | 165 | 179 | 210 | 213 | 206 | 1143 | 141 | 104 | 91 | 118 | 139 | 176 | 769 | 1912 |
| MONTLY AVG | 161.8 | 179.4 | 198.2 | 202.4 | 213.8 | 188.8 | 1144.4 | 153.6 | 113.4 | 105.8 | 122.6 | 133.4 | 165.4 | 794.2 | 1938.6 |
| DAILY AVG. | 5.39 | 5.79 | 6.61 | 6.53 | 6.90 | 6.29 | 6.25 | 4.95 | 3.78 | 3.41 | 3.95 | 4.76 | 5.34 | 4.36 | 5.31 |

Source: Irrigation Water Management Study at Kaudulla - Summary Report
Report No. OD 66 - March 1985.

## KAUDULLA HIGH LEVEL SLUICE - PENMAN E0 in mm (OPEN WATER EVAPORATION)

| YEAR | APR | MAY | JUN | JLY | AUG | SEP | YALA TOTAL | OCT | NOV | DEC | JAN | FEB | MAR | MAHA TOTAL | TOTAL ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1978/79 | 216 | 229 | 250 | 250 | 283 | 272 | 1500 | 210 | 157 | 146 | 176 | 172 | 221 | 1082 | 2582 |
| 1979/80 | 234 | 248 | 280 | 288 | 294 | 213 | 1557 | 196 | 138 | 136 | 163 | 188 | 230 | 1051 | 2608 |
| 1980/81 | 206 | 253 | 251 | 253 | 278 | 272 | 1513 | 204 | 133 | 140 | 153 | 154 | 210 | 994 | 2507 |
| 1981/82 | 207 | 231 | 253 | 222 | 268 | 209 | 1390 | 194 | 147 | 133 | 163 | 178 | 209 | 1024 | 2414 |
| 1982/83 | 211 | 202 | 228 | 271 | 271 | 244 | 1427 | 179 | 128 | 113 | 152 | 179 | 222 | 973 | 2400 |
| MONTHLY AV. | 214.8 | 232.6 | 252.4 | 256.8 | 278.8 | 242.0 | 1477.4 | 196.6 | 140.6 | 133.6 | 161.4 | 174.2 | 218.4 | 1024.8 | 2502 |
| DAILY AV. | 7.16 | 7.50 | 8.41 | 8.28 | 8.99 | 8.07 | 8.07 | 6.34 | 4.69 | 4.31 | 5.21 | 6.22 | 7.05 | 5.60 | 6.86 |

Source: Irrigation Water Management Study at Kaudulla - Summary Report
Report No. OD 66 - March 1985.

ON FARM WATER REQUIREMENTS --- MAHA PADDY

|←--------135 DAY PADDY ---------------------→|

| MONTH | OCT | NOV | DEC | JAN | FEB | MAR | TOTAL |
|---|---|---|---|---|---|---|---|
| STAGGER 1 | ░ ▨ 14 | Kc = 1·00<br>30 | Kc = 1·15<br>31 9 | Kc = 1·20<br>22 | 23 5 | ▤ 18 | |
| STAGGER 2 | ░ | ▨ 14 Kc = 1·00<br>16 | 14 Kc = 1·15<br>17 | 27 Kc = 1·20<br>28 | 28 9 | 5 ▤ 15 | |
| STAGGER 3 | ░ | ░ ▨ 14 | 2 Kc = 1·00 | 1 Kc = 1·15<br>31 6 | Kc = 1·20<br>22 23 | 5 ▤ | |
| MONTHLY ETO(mm) | 153.6 | 113.4 | 105.8 | 122.6 | 126.8 | 165.4 | 787.6 |
| ET FOR STAGGER 1 | —— | 37.8 | 40.56 | 13.64<br>34.80 | 41.66<br>6.79 | —— | |
| ET FOR STAGGER 2 | —— | 20.16 | 15.92<br>22.24 | 34.87<br>12.65 | 50.72 | 19.20<br>8.00 | |
| ET FOR STAGGER 3 | —— | 2.52 | 31.85<br>3.92 | 47.00 | 10.42<br>39.85 | 49.09<br>8.00 | |
| TOTAL ET (mm) | —— | 60.48 | 114.49 | 142.96 | 149.44 | 84.29 | 551.66 |
| LAND PREP.(mm) | 59.33 | 118.67 | —— | —— | —— | —— | 178 |
| SEEPAGE & PER.(mm) | —— | 80.00 | 155.00 | 155.00 | 140.00 | 70.00 | 600 |
| FWR (mm) | 59.33 | 259.15 | 269.49 | 297.96 | 289.44 | 154.29 | 1329.66 |
| 75% PROB.Re (mm) | 10.2 | 85 | 68 | 34 | 0 | 7.7 | 204.9 |
| FIR=FWR-Re (mm) | 49.13 | 174.15 | 201.49 | 263.96 | 289.44 | 146.59 | 1124.76 |

| | |
|---|---|
| ░ | FALLOW |
| ▨ | LAND PREP. |
| ▤ | NO IRRIGATION |

- * Monthly ETO taken from 5 year averages for Diyasenapura ref.Irrigation Water Management Study at Kaudulla --Report no.OD 66 - mar.1985.
- * Re for oct. & mar.computed proportionately for the irrigation period.
- * Seepage & percolation assumed to be 5mm per day.
- * Three equal staggers -- each covering 33.33% of the area.

Seasonal Water Report

| | |
|---|---|
| Season | Maha 1989 |
| Name of Reservoir | Giritale |
| Gross Storage Capacity in 1000M^3 | 24331.7 |
| Irrigable extent under specification (Ha) | 2510.0 |
| Present Irrigable Extent (ha) | 3035.0 |
| Reservoir height at commencement of water issue in meters | 6.9 |
| Anticipated seasonal inflow from Mahaweli System (Dry) 1000M^3 | 0.0 |
| Anticipated seasonal inflow from Mahaweli System (Ave) 1000M^3 | 0.0 |
| Seasonal inflow received from Mahaweli System 1000M^3 | 38705.9 |

Cultivation dates and extents as per decisions taken at Kanna meeting held on 16/10/89 are as follows.

Sluice number one :-

| Item | Agreed | Actual | Remarks |
|---|---|---|---|
| Extent Cultivated (total) | 3035.0 Ha | 3035.0 Ha | |
| Paddy variety :-105day | 3035.0 Ha | 3035.0 Ha | |
| O.F.C | 0.0 Ha | 0.0 Ha | |
| Date of first issue of water | 05/11/89 | 11/11/89 | |
| Date of last water issue | 15/03/90 | 11/03/90 | |
| Last date for broadcasting | 05/12/89 | / / | |
| Last date for transplanting | / / | / / | |
| Last date for harvesting | 30/03/90 | / / | |

## Details of parameters used in calculations

Evapotranspiration - (ETO)

| Month - | Oct | Nov | Dec | Jan | Feb | Mar |
|---|---|---|---|---|---|---|
| ETO mm/day | 5.0 | 3.7 | 3.4 | 4.0 | 4.5 | 5.3 |

100.0

Average 6.0

Open water evaporation - (EO)

| Month - | Oct | Nov | Dec | Jan | Feb | Mar |
|---|---|---|---|---|---|---|
| EO mm/day | 6.3 | 4.7 | 4.3 | 5.2 | 6.2 | 7.1 |

Crop Factors

Crop Group 1

| | | | | |
|---|---|---|---|---|
| Kc Values | 1.00 | 1.15 | 1.20 | 0.90 |
| No of days | 20 | 30 | 30 | 11 |

Seepage and percolation rate from paddy fields (mm/day) :- 4.0
Application efficiency for OFC :- 0 %
Land preparation period. Paddy (days) :- 14
Land preparation period. OFC (days) :- 0
Land preparation requirement. Paddy (mm) :- 178
Land preparation requirement. OFC (mm) :- 0
Number of staggers. Paddy :- 2
Number of staggers. OFC :- 0
Percentage area (paddy) under stagger 1 :- 60
Percentage area (paddy) under stagger 2 :- 40
Coveyance efficiency of augmentation supply :- 80 %

## Cultivation

| | |
|---|---|
| Extent Cultivated as a percentage of area under specification | 120.9 |
| Extent successfully harvested (Ha) | 3035.0 |
| Percentage of cultivation success | 100.0 |
| Average estimated yield (T/Ha) | 5.0 |

## Water Issue

| | | |
|---|---|---|
| Total Water Issues | 1000M^3 | 31159.2 |
| Calculated ave: water requirement for OFC | (M) | 0.0 |

## Calculated water allocation for OFC

| | | |
|---|---|---|
| From sluice number one | (1000M^3) | 0.0 |

## Duty

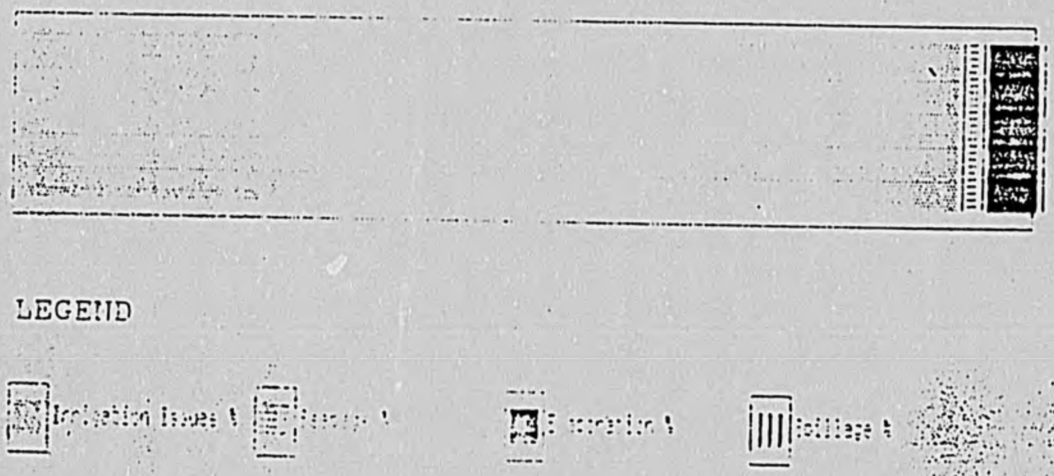
| | | |
|---|---|---|
| Scheme Duty (paddy) excluding EF | (M) | 1.03 |
| Rainfall during the season | (mm) | 721.0 |
| Estimated effective rainfall (EF) during the season | (mm) | 432.3 |
| Scheme duty (paddy) including EF | (M) | 1.46 |
| Ave. paddy yield/unit of water used | (Kg/M^3) | 0.34 |
| Calculated field water requirement | (M) | 0.99 |
| Calculated field irrigation requirement | (M) | 0.56 |
| Canal system efficiency | % | 0.55 |

## Reservoir Water Balance

| | |
|---|---|
| Yield from catchment (1000M^3) | 4502.6 |
| Total Inflow (1000M^3)<br>(Catchment yield + Augmentation Supply) | 43208.5 |
| Change in storage (1000M^3) | 4920.5 |
| * Issues for Irrigation (1000M^3)<br>(from reservoir water balance) | 36585.0 |
| Issues as measured from sluice discharges (1000M^3) | 31159.2 |

| Item | Value | Percentage |
|---|---|---|
| Irrigation Issues | 31159 | 95 |
| Seepage | 209 | 1 |
| Evaporation | 1494 | 5 |
| Spillage | 0 | 0 |

## Reservoir Water Balance



* Inflow - Change in Storage = Issues for Irrigation + Losses

RESERVOIR PERFORMANCE

| Date | Water Level (M) | Water Surface Area (Ha) | Capacity (1000M^3) | Discharge from Sluice (1000M^3) | Spillage (1000M^3) | Estimated Evaporation Loss (1000M^3) | Estimated Seepage & Percolation Loss (1000^M3) | Augmentation Supply (1000M^3) | Catchment Inflow (1000M^3) |
|---|---|---|---|---|---|---|---|---|---|
| 11/11/89 | 6.9 | 204.9 | 7229.2 | 244.5 | 0.0 | 9.6 | 1.2 | 114.9 | 0.00 |
| 12/11/89 | 6.7 | 202.4 | 7041.5 | 244.5 | 0.0 | 9.4 | 1.1 | 107.1 | 81.19 |
| 13/11/89 | 6.5 | 197.3 | 6666.1 | 427.5 | 0.0 | 9.2 | 1.1 | 72.5 | 124.90 |
| 14/11/89 | 6.3 | 191.9 | 6273.1 | 427.6 | 0.0 | 9.0 | 1.0 | 95.5 | 62.45 |
| 15/11/89 | 6.0 | 183.2 | 5744.4 | 427.5 | 0.0 | 8.6 | 0.9 | 97.6 | 124.90 |
| 16/11/89 | 5.8 | 177.4 | 5392.9 | 427.6 | 0.0 | 8.3 | 0.9 | 70.8 | 31.23 |
| 17/11/89 | 5.5 | 168.5 | 4883.4 | 549.5 | 0.0 | 7.9 | 0.9 | 90.3 | 18.73 |
| 18/11/89 | 5.2 | 159.8 | 4392.2 | 549.5 | 0.0 | 7.5 | 0.7 | 101.9 | 99.92 |
| 19/11/89 | 4.8 | 148.7 | 3855.9 | 513.0 | 0.0 | 6.9 | 0.6 | 43.3 | 181.10 |
| 20/11/89 | 4.5 | 140.1 | 3441.2 | 488.0 | 0.0 | 6.5 | 0.5 | 36.2 | 81.19 |
| 21/11/89 | 4.1 | 130.7 | 3065.1 | 427.5 | 0.0 | 6.1 | 0.5 | 72.5 | 12.49 |
| 22/11/89 | 3.8 | 118.3 | 2563.5 | 488.0 | 0.0 | 5.8 | 0.4 | 616.0 | 131.15 |
| 23/11/89 | 3.7 | 115.2 | 2433.1 | 488.0 | 0.0 | 5.4 | 0.4 | 914.1 | 0.00 |
| 24/11/89 | 3.9 | 121.4 | 2688.9 | 513.0 | 0.0 | 5.7 | 0.4 | 967.6 | 0.00 |
| 25/11/89 | 4.0 | 127.6 | 2939.7 | 488.0 | 0.0 | 5.9 | 0.4 | 982.3 | 143.63 |
| 26/11/89 | 4.4 | 137.0 | 3315.8 | 513.0 | 0.0 | 6.4 | 0.5 | 1006.5 | 0.00 |
| 27/11/89 | 4.5 | 140.4 | 3453.7 | 513.0 | 0.0 | 6.5 | 0.5 | 958.1 | 18.73 |
| 28/11/89 | 4.8 | 148.7 | 3855.9 | 549.5 | 0.0 | 6.9 | 0.6 | 737.8 | 0.00 |
| 29/11/89 | 4.8 | 148.7 | 3855.9 | 513.0 | 0.0 | 6.9 | 0.6 | 891.6 | 299.76 |
| 30/11/89 | 5.0 | 154.2 | 4124.1 | 366.0 | 0.0 | 7.2 | 0.6 | 990.1 | 81.19 |
| 01/12/89 | 5.5 | 168.8 | 4863.4 | 0.0 | 0.0 | 7.2 | 0.8 | 819.0 | 224.82 |
| 02/12/89 | 6.0 | 183.2 | 5744.4 | 0.0 | 0.0 | 7.9 | 0.9 | 843.2 | 112.41 |
| 03/12/89 | 6.5 | 197.3 | 6666.1 | 0.0 | 0.0 | 8.5 | 1.1 | 950.4 | 31.23 |
| 04/12/89 | 6.9 | 207.5 | 7416.9 | 0.0 | 0.0 | 8.9 | 1.2 | 931.3 | 43.72 |
| 05/12/89 | 7.1 | 211.6 | 7793.0 | 304.9 | 0.0 | 9.1 | 1.3 | 948.6 | 6.25 |
| 06/12/89 | 7.3 | 215.7 | 8017.6 | 304.9 | 0.0 | 9.3 | 1.3 | 990.1 | 0.00 |
| 07/12/89 | 7.6 | 221.5 | 8633.5 | 304.9 | 0.0 | 9.6 | 1.4 | 914.1 | 12.49 |
| 08/12/89 | 7.7 | 228.8 | 9135.3 | 304.9 | 0.0 | 9.8 | 1.5 | 908.9 | 0.00 |
| 09/12/89 | 7.9 | 234.0 | 9533.1 | 304.9 | 0.0 | 10.2 | 1.5 | 1026.4 | 0.00 |
| 10/12/89 | 8.1 | 236.6 | 9906.3 | 304.9 | 0.0 | 10.2 | 1.6 | 1004.8 | 0.00 |
| 11/12/89 | 8.2 | 241.8 | 10283.2 | 244.5 | 0.0 | 10.4 | 1.7 | 978.0 | 0.00 |
| 12/12/89 | 8.4 | 246.2 | 10744.1 | 244.5 | 0.0 | 10.6 | 1.7 | 978.0 | 0.00 |
| 13/12/89 | 8.6 | 250.7 | 11205.3 | 244.5 | 0.0 | 10.8 | 1.8 | 978.0 | 31.23 |
| 14/12/89 | 8.8 | 252.9 | 11435.4 | 0.0 | 0.0 | 10.9 | 1.9 | 620.3 | 49.96 |
| 15/12/89 | 9.0 | 259.5 | 12135.7 | 0.0 | 0.0 | 11.1 | 2.0 | 799.2 | 168.62 |
| 16/12/89 | 9.2 | 263.6 | 12672.6 | 0.0 | 0.0 | 11.3 | 2.1 | 943.4 | 0.00 |
| 17/12/89 | 9.5 | 269.2 | 13457.0 | 0.0 | 0.0 | 11.6 | 2.2 | 870.0 | 43.72 |
| 18/12/89 | 9.8 | 273.3 | 13979.3 | 366.0 | 0.0 | 11.7 | 2.3 | 943.4 | 0.00 |
| 19/12/89 | 9.9 | 276.8 | 14502.7 | 488.0 | 0.0 | 11.9 | 2.4 | 444.9 | 0.00 |
| 20/12/89 | 9.9 | 274.9 | 14241.3 | 488.0 | 0.0 | 11.8 | 2.3 | 85.5 | 0.00 |
| 21/12/89 | 9.7 | 271.1 | 13718.4 | 488.0 | 0.0 | 11.6 | 2.2 | 97.2 | 0.00 |
| 22/12/89 | 9.6 | 271.1 | 13718.4 | 244.5 | 0.0 | 11.6 | 2.2 | 95.0 | 0.00 |
| 23/12/89 | 9.6 | 269.2 | 13457.0 | 0.0 | 0.0 | 11.5 | 2.2 | 97.6 | 0.00 |
| 24/12/89 | 9.6 | 269.2 | 13457.0 | 0.0 | 0.0 | 11.5 | 2.2 | 107.1 | 0.00 |
| 25/12/89 | 9.6 | 269.2 | 13457.0 | 488.0 | 0.0 | 11.5 | 2.2 | 19.0 | 0.00 |

BEST AVAILABLE COPY

## RESERVOIR PERFORMANCE

| Date | Water Level (M) | Water Surface Area (Ha) | Capacity (1000M^3) | Discharge from Sluice (1000M^3) | Spillage (1000M^3) | Estimated Evaporation Loss (1000M^3) | Estimated Seepage & Percolation Loss (1000M^3) | Augmentation Supply (1000M^3) | Catchment Inflow (1000M^3) |
|---|---|---|---|---|---|---|---|---|---|
| 26/12/89 | 9.4 | 265.4 | 12934.1 | 433.0 | 0.0 | 11.4 | 2.1 | 45.7 | 0.00 |
| 27/12/89 | 9.2 | 261.7 | 12411.2 | 433.0 | 0.0 | 11.2 | 2.0 | 43.2 | 0.00 |
| 28/12/89 | 9.0 | 259.5 | 12126.7 | 366.0 | 0.0 | 11.1 | 2.0 | 95.0 | 0.00 |
| 29/12/89 | 8.8 | 255.1 | 11665.8 | 244.5 | 0.0 | 11.0 | 1.9 | 26.7 | 0.00 |
| 30/12/89 | 8.7 | 252.9 | 11435.4 | 0.0 | 0.0 | 10.9 | 1.9 | 70.8 | 0.00 |
| 31/12/89 | 8.7 | 252.9 | 11435.4 | 0.0 | 0.0 | 10.9 | 1.9 | 70.8 | 0.00 |
| 01/01/90 | 8.7 | 252.9 | 11435.4 | 433.0 | 0.0 | 13.1 | 1.9 | 70.8 | 0.00 |
| 02/01/90 | 8.5 | 246.2 | 10744.1 | 433.0 | 0.0 | 12.8 | 1.7 | 53.5 | 0.00 |
| 03/01/90 | 8.3 | 241.3 | 10283.2 | 433.0 | 0.0 | 12.6 | 1.7 | 4.3 | 0.00 |
| 04/01/90 | 8.0 | 236.6 | 9806.3 | 244.5 | 0.0 | 12.3 | 1.6 | 0.0 | 724.42 |
| 05/01/90 | 8.0 | 236.6 | 9806.3 | 0.0 | 0.0 | 12.3 | 1.6 | 197.8 | 1273.96 |
| 06/01/90 | 8.7 | 252.9 | 11435.4 | 0.0 | 0.0 | 13.1 | 1.9 | 100.2 | 49.96 |
| 07/01/90 | 8.7 | 252.9 | 11435.4 | 0.0 | 0.0 | 13.1 | 1.9 | 327.4 | 0.00 |
| 08/01/90 | 8.9 | 255.1 | 11665.8 | 0.0 | 0.0 | 13.2 | 1.9 | 133.9 | 99.92 |
| 09/01/90 | 9.0 | 259.5 | 12126.7 | 0.0 | 0.0 | 13.5 | 2.0 | 60.4 | 0.00 |
| 10/01/90 | 9.0 | 259.5 | 12126.7 | 0.0 | 0.0 | 13.5 | 2.0 | 60.4 | 0.00 |
| 11/01/90 | 9.0 | 259.5 | 12126.7 | 0.0 | 0.0 | 13.5 | 2.0 | 579.9 | 0.00 |
| 12/01/90 | 9.1 | 261.7 | 12411.2 | 433.0 | 0.0 | 13.6 | 2.0 | 586.6 | 0.00 |
| 13/01/90 | 9.1 | 261.7 | 12411.2 | 433.0 | 0.0 | 13.6 | 2.0 | 579.9 | 0.00 |
| 14/01/90 | 9.1 | 259.5 | 12126.7 | 433.0 | 0.0 | 13.5 | 2.0 | 857.9 | 0.00 |
| 15/01/90 | 9.1 | 259.5 | 12126.7 | 366.0 | 0.0 | 13.5 | 2.0 | 979.0 | 0.00 |
| 16/01/90 | 9.2 | 263.6 | 12672.6 | 244.5 | 0.0 | 13.7 | 2.1 | 864.8 | 0.00 |
| 17/01/90 | 9.4 | 265.4 | 12934.1 | 244.5 | 0.0 | 13.3 | 2.1 | 870.0 | 0.00 |
| 18/01/90 | 9.6 | 271.1 | 13718.4 | 0.0 | 0.0 | 14.1 | 2.2 | 789.7 | 0.00 |
| 19/01/90 | 9.9 | 274.9 | 14241.3 | 433.0 | 0.0 | 14.3 | 2.3 | 752.5 | 0.00 |
| 20/01/90 | 10.1 | 278.7 | 14866.3 | 433.0 | 0.0 | 14.5 | 2.4 | 628.1 | 0.00 |
| 21/01/90 | 10.1 | 278.7 | 14866.3 | 433.0 | 0.0 | 14.5 | 2.4 | 735.2 | 0.00 |
| 22/01/90 | 10.1 | 280.3 | 15178.5 | 366.0 | 0.0 | 14.6 | 2.5 | 908.9 | 0.00 |
| 23/01/90 | 10.2 | 280.3 | 15178.5 | 366.0 | 0.0 | 14.6 | 2.5 | 908.9 | 0.00 |
| 24/01/90 | 10.3 | 281.8 | 15490.3 | 244.5 | 0.0 | 14.6 | 2.5 | 970.2 | 0.00 |
| 25/01/90 | 10.4 | 285.0 | 16113.5 | 0.0 | 0.0 | 14.3 | 2.6 | 520.1 | 0.00 |
| 26/01/90 | 10.6 | 286.5 | 16425.6 | 0.0 | 0.0 | 14.9 | 2.7 | 100.2 | 0.00 |
| 27/01/90 | 10.6 | 286.5 | 16425.6 | 0.0 | 0.0 | 14.9 | 2.7 | 92.4 | 0.00 |
| 28/01/90 | 10.6 | 286.5 | 16425.6 | 433.0 | 0.0 | 14.9 | 2.7 | 97.6 | 0.00 |
| 29/01/90 | 10.5 | 285.0 | 16113.5 | 433.0 | 0.0 | 14.3 | 2.6 | 75.1 | 0.00 |
| 30/01/90 | 10.3 | 281.8 | 15490.3 | 549.5 | 0.0 | 14.6 | 2.5 | 12.1 | 12.49 |
| 31/01/90 | 10.1 | 280.3 | 15178.5 | 304.9 | 0.0 | 14.6 | 2.5 | 0.0 | 0.00 |
| 01/02/90 | 10.0 | 277.2 | 14555.0 | 304.9 | 0.0 | 17.2 | 2.4 | 0.0 | 0.00 |
| 02/02/90 | 9.9 | 274.9 | 14241.3 | 0.0 | 0.0 | 17.1 | 2.3 | 50.9 | 0.00 |
| 03/02/90 | 9.9 | 274.9 | 14241.3 | 0.0 | 0.0 | 17.1 | 2.3 | 107.1 | 0.00 |
| 04/02/90 | 9.9 | 274.9 | 14241.3 | 0.0 | 0.0 | 17.1 | 2.3 | 141.7 | 0.00 |
| 05/02/90 | 9.9 | 274.9 | 14241.3 | 0.0 | 0.0 | 17.1 | 2.3 | 107.1 | 0.00 |
| 06/02/90 | 9.8 | 273.0 | 13979.3 | 433.0 | 0.0 | 16.9 | 2.3 | 9.5 | 0.00 |
| 07/02/90 | 9.6 | 269.2 | 13457.0 | 433.0 | 0.0 | 16.7 | 2.2 | 0.0 | 0.00 |
| 08/02/90 | 9.4 | 265.4 | 12934.1 | 433.0 | 0.0 | 16.5 | 2.1 | 0.0 | 0.00 |

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## RESERVOIR PERFORMANCE

| Date | Water Level (M) | Water Surface Area (Ha) | Live Capacity (1000M^3) | Discharge through Sluice (1000M^3) | Spillage (1000M^3) | Estimated Evaporation Loss (1000M^3) | Estimated Seepage & Percolation Loss (1000M^3) | Augmentation Supply (1000M^3) | Catchment Inflow (1000M^3) |
|---|---|---|---|---|---|---|---|---|---|
| 09/02/90 | 9.2 | 261.7 | 12411.2 | 366.3 | 0.0 | 16.2 | 2.0 | 95.0 | 0.00 |
| 10/02/90 | 9.0 | 259.5 | 12126.7 | 366.3 | 0.0 | 16.1 | 2.0 | 100.2 | 0.00 |
| 11/02/90 | 9.0 | 257.3 | 11896.3 | 0.0 | 0.0 | 16.0 | 1.9 | 131.3 | 0.00 |
| 12/02/90 | 9.0 | 257.3 | 11896.3 | 433.0 | 0.0 | 16.0 | 1.9 | 146.0 | 0.00 |
| 13/02/90 | 8.8 | 252.9 | 11435.4 | 433.3 | 0.0 | 15.7 | 1.9 | 45.7 | 0.00 |
| 14/02/90 | 8.6 | 248.4 | 10974.5 | 433.0 | 0.0 | 15.4 | 1.8 | 19.0 | 0.00 |
| 15/02/90 | 8.4 | 244.0 | 10513.7 | 366.3 | 0.0 | 15.1 | 1.7 | 0.0 | 0.00 |
| 16/02/90 | 8.2 | 241.5 | 10283.2 | 366.3 | 0.0 | 15.0 | 1.7 | 31.1 | 0.00 |
| 17/02/90 | 8.2 | 239.3 | 10030.5 | 0.0 | 0.0 | 14.8 | 1.6 | 119.2 | 0.00 |
| 18/02/90 | 8.2 | 239.3 | 10030.5 | 0.0 | 0.0 | 14.9 | 1.6 | 127.0 | 0.00 |
| 19/02/90 | 8.2 | 239.3 | 10030.5 | 433.0 | 0.0 | 14.8 | 1.6 | 72.5 | 0.00 |
| 20/02/90 | 8.0 | 234.0 | 9583.0 | 433.0 | 0.0 | 14.5 | 1.6 | 0.0 | 0.00 |
| 21/02/90 | 7.7 | 228.8 | 9135.3 | 433.0 | 0.0 | 14.2 | 1.5 | 0.0 | 0.00 |
| 22/02/90 | 7.5 | 220.9 | 8464.9 | 183.3 | 0.0 | 13.7 | 1.4 | 75.1 | 0.00 |
| 23/02/90 | 7.3 | 218.3 | 8241.2 | 244.3 | 0.0 | 13.5 | 1.3 | 109.7 | 0.00 |
| 24/02/90 | 7.2 | 215.1 | 7930.0 | 0.0 | 0.0 | 13.3 | 1.3 | 128.7 | 0.00 |
| 25/02/90 | 7.2 | 215.1 | 7930.0 | 0.0 | 0.0 | 13.3 | 1.3 | 72.5 | 0.00 |
| 26/02/90 | 7.3 | 215.7 | 8017.6 | 0.0 | 0.0 | 13.4 | 1.3 | 554.6 | 0.00 |
| 27/02/90 | 7.6 | 223.5 | 8688.5 | 0.0 | 0.0 | 13.9 | 1.4 | 696.3 | 0.00 |
| 28/02/90 | 7.9 | 231.4 | 9359.5 | 0.0 | 0.0 | 14.4 | 1.5 | 672.1 | 0.00 |
| 01/03/90 | 8.1 | 239.3 | 10030.5 | 0.0 | 0.0 | 16.3 | 1.6 | 661.8 | 0.00 |
| 02/03/90 | 8.4 | 244.0 | 10513.7 | 0.0 | 0.0 | 17.2 | 1.7 | 446.6 | 0.00 |
| 03/03/90 | 8.4 | 244.0 | 10513.7 | 244.3 | 0.0 | 17.2 | 1.7 | 434.5 | 124.90 |
| 04/03/90 | 8.4 | 244.0 | 10513.7 | 0.0 | 0.0 | 17.2 | 1.7 | 469.1 | 0.00 |
| 05/03/90 | 8.5 | 248.4 | 10974.5 | 0.0 | 0.0 | 17.5 | 1.8 | 478.6 | 0.00 |
| 06/03/90 | 8.6 | 250.7 | 11205.0 | 0.0 | 0.0 | 17.6 | 1.8 | 1028.1 | 0.00 |
| 07/03/90 | 8.8 | 255.1 | 11665.2 | 0.0 | 0.0 | 17.9 | 1.9 | 390.5 | 0.00 |
| 08/03/90 | 8.9 | 257.3 | 11896.3 | 0.0 | 0.0 | 18.1 | 1.9 | 630.7 | 0.00 |
| 09/03/90 | 9.1 | 259.3 | 12149.7 | [illegible] | 0.0 | 18.3 | 2.0 | 622.9 | 0.00 |
| Totals |  |  |  | [illegible] | 0.0 | 1434.1 | 208.9 | 48382.3 | 4502.64 |

## ON FARM WATER REQUIREMENTS --- YALA PADDY

|←------------ 105 DAY PADDY ------------→|

| MONTH | APR | MAY | JUN | JUL | AUG | TOTAL |
|---|---|---|---|---|---|---|
| STAGGER 1 | ░ ▨ 14 | Kc=1·00 20 | Kc=1·15 19 <br> 11 | Kc=1·20 19 <br> Kc=·9 10 <br> 3 | ☰ 17 | |
| STAGGER 2 | ░ | ▨ 14 <br> Kc=1·00 17 | 3 <br> Kc=1·15 27 | 3 <br> Kc=1·20 28 | 2 <br> Kc=·9 10 <br> ☰ | |
| STAGGER 3 | ░ | ░ ▨ 14 | 3 <br> Kc=1·00 17 <br> Kc=1·15 13 | 17 <br> Kc=1·20 14 | 16 <br> Kc=·9 10 <br> ☰ | |
| MONTHLY ETO(mm) | 161.8 | 179.4 | 198.2 | 202.4 | 213.8 | 955.6 |
| ET FOR STAGGER 1 | —— | 38.58 <br> 24.40 | 48.12 <br> 29.07 | 49.62 <br> 19.58 | —— | |
| ET FOR STAGGER 2 | —— | 32.79 | 6.61 <br> 68.38 | 7.51 <br> 73.12 | 5.52 <br> 20.69 | |
| ET FOR STAGGER 3 | —— | 5.79 | 37.44 <br> 32.92 | 36.56 | 44.14 <br> 20.69 | |
| TOTAL ET (mm) | —— | 101.56 | 222.54 | 228.94 | 91.04 | 644.08 |
| LAND PREP.(mm) | 59.33 | 118.67 | —— | —— | —— | 178.00 |
| SEEPAGE & PER.(mm) | —— | 85 | 150 | 155 | 63.3 | 453.33 |
| FWR (mm) | 59.33 | 305.23 | 372.54 | 383.94 | 154.34 | 1275.38 |
| 75% PROB. Re (mm) | 10.6 | 14.4 | 0 | 0 | 0 | 25.00 |
| FIR=FWR-Re (mm) | 48.73 | 290.83 | 372.54 | 383.94 | 154.34 | 1250.38 |

| | |
|---|---|
| ░ | FALLOW |
| ▨ | LAND PREP. |
| ☰ | NO IRRIGATION |

- * Monthly ETO taken from 5 year averages for Diyasenapura ref.Irrigation Water Management Study at Kaudulla --Report no.OD 66 - mar.1985.
- * Re for apr. & aug.computed proportionately for the irrigation period.
- * Seepage & percolation assumed to be 5mm per day.
- * Three equal staggers -- each covering 33.33% of the area.

## GIRITALE SCHEME
## MAIN SYSTEM - OPERATION COST

### GENERAL

Estimation of the operation cost of Giritale Scheme is based on the following assumptions.

a) In the near future the DCO's will assume responsibility for the control and issue of water in the distributary system below D canal head gates, under the technical guidance of the ID.

b) The ID will operate the main system (inlet canal from EMYE, Giritale Tank, R.B. Main canal including Dambala Wewa, Kadawala Wewa and Chandana Pokuna reservoirs) and all other components of the distributary system will be operated by the F.O.

### STAFFING

The staffing schedule given below provides for the requirements during the initial transitionary period of participatory management when ID field staff will have to assist the DCO's in their new responsibilities. When active participation of the F.O. in the management of the distributary system becomes a reality, ID staffing for operations should be reviewed.

| UNIT | ID STAFF | | ANNUAL INPUTS PERSON - MONTHS |
|---|---|---|---|
| Operations Center (IE's Office) | * Computer Operator | 1 | 6 |
| Giritale Field Operations Unit | TA | 1 | 4 |
| | WS | 1 | 4 |
| | Irrigators | 2 | 16 |
| Jayanthipura Field Operations Unit | TA | 1 | 4 |
| | WS | 1 | 4 |
| | Irrigators | 2 | 16 |
| Chandanapokuna Field Operations Unit | TA | 1 | 4 |
| | WS | 1 | 4 |
| | Irrigators | 2 | 16 |
| Total for scheme | Computer Operator | | 6 |
| | TA | | 12 |
| | WS | | 12 |
| | Irrigators | | 48 |

* Computer operator's time is divided equally between Giritale and Minneriya Schemes.

In the case of T.A & W.S. attached to field operation units, during water issue period (8 months in an year) half their time is apportioned to operations and the other half to maintenance.

## ANNUAL OPERATION COST

The annual operation cost could be analysed as consisting of three main components namely:

(1) The direct cost of emoluments paid to ID operation staff.
(2) The indirect cost of a) fuel, repairs to vehicles and equipment b) drivers and operators c) depreciation of vehicles and equipment d) administration and departmental overheads
(3) A contingency cost.

The cost of item (1) can be determined from required man-power inputs and applicable rates.

## EMOLUMENTS

Monthly rates of emoluments of ID operation staff

| Category | Monthly Salary Rs. | Allowances (Travl.+Subs.) Rs. | O/T Pay Rs. | Total Monthly Rate. Rs |
|---|---|---|---|---|
| Computer Operator | 3000 | ---- | --- | 3000 |
| Technical Assistant | * NA | 1250 | --- | 1250 |
| Work Supervisor | 2250 | 600 | --- | 2850 |
| Irrigator | 1950 | 50 | 250 | 2250 |

* Technical Assistants salaries are met from Personal Emoluments and is included in ID administration costs.

Estimated Annual Emolument costs

| Category | Person Months | Monthly Rate.Rs | Amount Rs. |
|---|---|---|---|
| Computer Operator | 6 | 3000 | 18000 |
| Technical Assistants | 12 | 1250 | 15000 |
| Work Supervisors | 12 | 2850 | 34200 |
| Irrigators | 48 | 2250 | 108000 |
| Total | | | 175200 |

The cost of item (2) is to be estimated after a detail analysis. Such an analysis is presented in annex A. based upon analysis of 1981 performance in 16 selected major Irrigation Schemes at one per range and updated to 1988 prices.

These are the best available data and the per acre costs of sub items 2 (b), 2 (c) and 2 (d) are as follows:

| | | Sub Item | Cost/Ac<br>Rs. Cts. |
|---|---|---|---|
| 2. | a. | Fuel & repairs to vehicles | 3.72 |
| 2. | b. | Drivers and Operators | 2.54 |
| 2. | c. | Depreciation of vehicles & equipment | 21.00 |
| 2. | d. | Administration & Overheads | 13.50 |
| | | | ------ |
| | | Sub total | 40.76 |
| | | | ====== |

## MATERIALS AND TOOLS

Since cost of lubricants, stop planks and repair of gates and lifting mechanisms is charged to maintenance there is no identifiable cost for materials and tools apportionable to operations.

## DIRECT COSTS

| | | | |
|---|---|---|---|
| Annual emolument costs | Rs. | 175,200 | |
| Physical contingencies (7.5%) | Rs. | 13,140 | |
| Direct costs | Rs. | 188,340 | |
| Irrigable extent under scheme | | | 7500 Ac |
| Direct cost operation per Ac | Rs. | 25.11 | |
| Indirect costs | Rs. | 40.76 | |
| Total operation cost/Acre | Rs. | 65.87 | |
| | | ----- | |
| Operation cost exclusive of | Rs. | 65.87-Rs.13.50 | |
| Administration & wverheads | Rs. | 52.37 per Ac | |

# GIRITALE SCHEME
## OPERATION COSTS - DCO AREAS
## DCO No.1 PURANAGAMA

Total irrigable extent 1064 Ac
No of irrigators required = 2
Total annual man-power requirement = 2 x 8 = 16 perosn months

Monthly salary Rs 60 x 30 = Rs. 1800
Cycle allowance = Rs. 100
Total monthly emolument = Rs. 1900
Annual emolument Costs = Rs. 1900 x 16
= Rs. 30400
Contingences (75%) = Rs. 2280
Direct cost = Rs. 32600
DCO Administration costs
(5 % of direct costs) = Rs. 1634
Total operation cost = Rs. 34314
Operation cost/Ac = Rs. 32.25
=========

GTLSCOPR

# CHAPTER V

## BALANCE WORK REQUIRED TO ACHIEVE TARGETS

Successful implementation of improved system operations depends on fulfilling a number of tasks identified on Table V-1, below, however, the most important requirement is the commitment and the realization by the ID field staff, that this is a worthwhile pursuit.

TABLE V-I

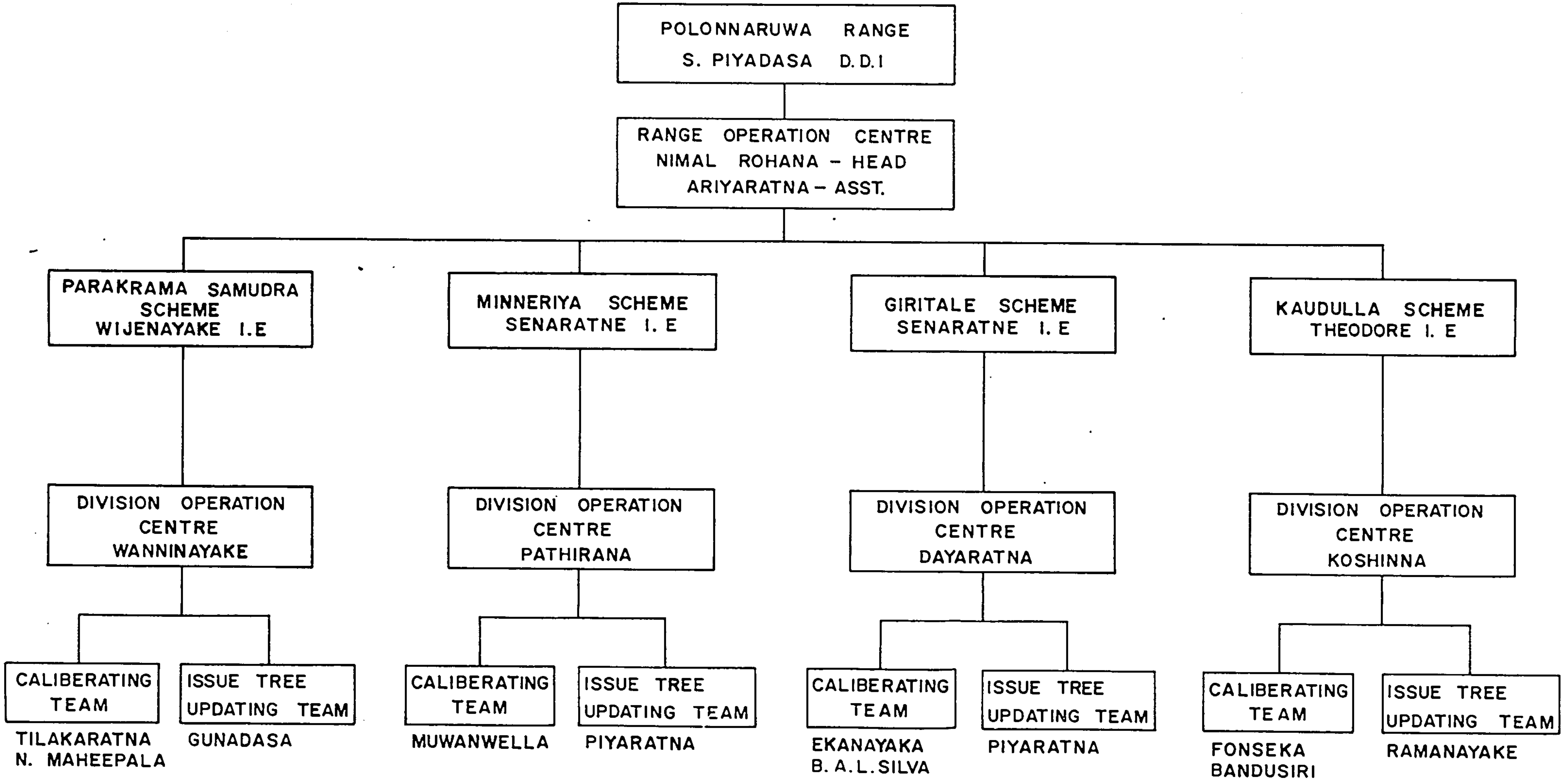
IMPLEMENTATION PROGRAM FOR IMPROVED SYSTEMS OPERATIONS

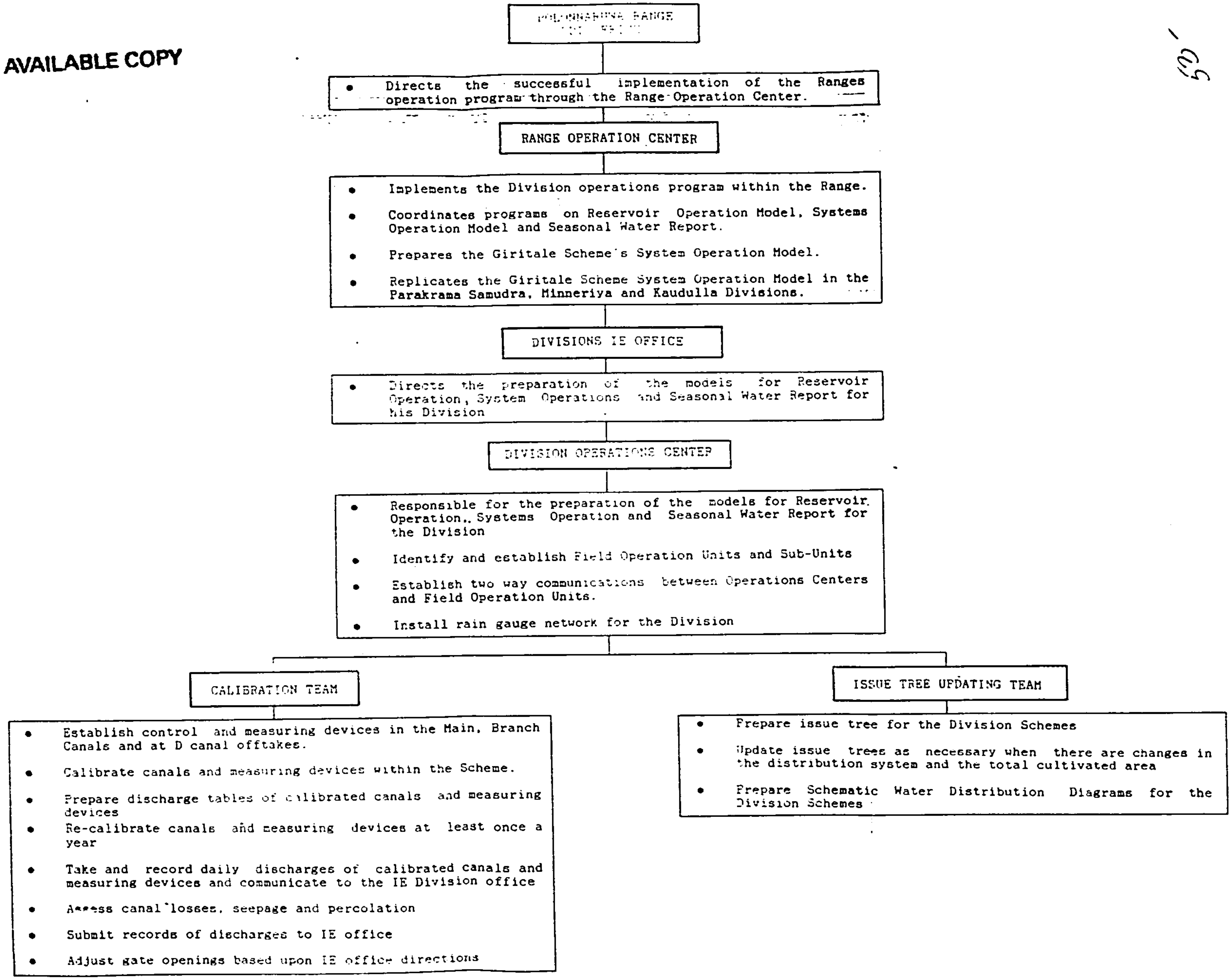
| Item No. | Scheme | Activity | Organiz. Respon | 1991 1st Qtr. | 2 Qtr | 3 Qtr. | 4 Qtr. | 1992 1st Qt |
|---|---|---|---|---|---|---|---|---|
| 1 | All | Procure and install gages in main system | ID | -------- | | | | |
| 2 | All | Calibrate measuring devices in main system | ID | | --- | ------ | | |
| 3 | All | Up grade "issue trees" | ID | -------- | ------ | | | |
| 4 | Gal Oya | Procure and install computer at Ampara IE's office | IMD/ID | | ------ | | | |
| 5 | All | Assess canal losses in main system | ID | | ------ | --- | | |
| 6 | Gal Oya LB & RB | Collect data and calibrate reservoir operation model for Senanayaka Samudra | ID | -------- | | | | |
| 7 | Gal Oya RB | Prepare control and issue diagram | ID/SAI | -------- | | | | |
| 8 | All | Set up two way Communication system between operation center and field units | ID | | --- | --- | | |
| 9 | All | Deployment of personnel and implementation of improved system operations | | GIRITALE<br>-------- | MIN<br>----<br>RBE | KAUD<br>----<br>PSS | GAL OYA RB<br>--- | ------ |
| 10 | All | Install gages in distributary system | ID | | --- -- | -- -- | -- | -- -- |
| 11 | All | Calibrate measuring devices in distributary system | ID | | --- | -- -- | -- --- | --- |
| 12 | All | Assess canal losses in distributary system | ID | | | --- | -- --- | -- |
| 13 | Gal Oya RB, RBE | Procure and install rain gages | IMD/ID | | ---- | --- | | |
| 14 | All | Refinement of system operation | ID | | | | | --- |

The Schedule of the above activities has been drawn up on the assumption that the ISMP completion date is 30 June 1992. Since it is very unlikely that construction of D canals in Gal Oya RB will be completed by that date. Therefore, if further funding is provided activities 10 to 14 will necessarily continue beyond the 30 June 1992. To implement the above schedules in Polonnaruwa Range a Water Management Cell must be formed in early 1991. the recommended organization chart for the Water Management Cell is shown on Exhibit V-1. Exhibit V-2 presents the Water Management Cell Functional Chart indicating the functions of each component of the Cell.

Early in the study it was realized that some of the ID field staff responsible for system operations are living far away from their areas of work due to inadequate housing. Since it was felt that full attention of the staff could only be expected if they live in or in close prseemety to their work areas, proposals were framed for the construction of 8 new quarters and effecting improvement to 13 existing quarters. Due to some reason or other those proposals were not implemented. If funding could be found it is recommended that these be implemented as early as possible. The locations and estimates are given on Exhibit V-3.

# SYSTEMS OPERATION
## WATER MANAGEMENT CELL
## ORGANIZATION CHART





**POLONNARUWA RANGE**
[illegible]

- Directs the successful implementation of the Ranges operation program through the Range Operation Center.

**RANGE OPERATION CENTER**

- Implements the Division operations program within the Range.
- Coordinates programs on Reservoir Operation Model, Systems Operation Model and Seasonal Water Report.
- Prepares the Giritale Scheme's System Operation Model.
- Replicates the Giritale Scheme System Operation Model in the Parakrama Samudra, Minneriya and Kaudulla Divisions.

**DIVISIONS IE OFFICE**

- Directs the preparation of the models for Reservoir Operation, System Operations and Seasonal Water Report for his Division

**DIVISION OPERATIONS CENTER**

- Responsible for the preparation of the models for Reservoir Operation., Systems Operation and Seasonal Water Report for the Division
- Identify and establish Field Operation Units and Sub-Units
- Establish two way communications between Operations Centers and Field Operation Units.
- Install rain gauge network for the Division

**CALIBRATION TEAM**

- Establish control and measuring devices in the Main, Branch Canals and at D canal offtakes.
- Calibrate canals and measuring devices within the Scheme.
- Prepare discharge tables of calibrated canals and measuring devices
- Re-calibrate canals and measuring devices at least once a year
- Take and record daily discharges of calibrated canals and measuring devices and communicate to the IE Division office
- Assess canal losses, seepage and percolation
- Submit records of discharges to IE office
- Adjust gate openings based upon IE office directions

**ISSUE TREE UPDATING TEAM**

- Prepare issue tree for the Division Schemes
- Update issue trees as necessary when there are changes in the distribution system and the total cultivated area
- Prepare Schematic Water Distribution Diagrams for the Division Schemes

# INTER – OFFICE CORRESPONDENCE

To : DR.L.E.Haley

Location:Colombo

Date :July 12, 1988

From: C.F.Leonhardt

Location:Polonnaruwa

Subject: Systems Operation Plan. Communication
and Building requirements.

The ID/IMD/ USAID have aproved in principal the System Operation Plan for the ISMP. As submitted in your letter titled "ISMP Operation" to Mr. Botejue on 18 March 1988 there are certain infrastructural facilities that must be provided inorder to implement this Plan. Two of the most important infrastructural facilities are Item No. 1 – Identification and establishment of Field Operation Units and Sub-units and Item No. 2- Establishment of two-way Communication between Operation Centers are Field Operation Units (please refer to your letter for details of these two items.)

After investigation into the appropriate communication network for the Systems Operation Plan it was established that telephone communication was not feasible due to high cost. The alternative is a radio phone communication network that will allow the Field Operation Units to communicate directly with the Scheme Operation Centers. A total of twenty (20) radio phone units will be required for the four Schemes in the Polonnaruwa Range. Preliminary cost of these units is in the range of about Rs.30,000/unit. Detailed estimates of the cost and specifications will be fourthcoming for your submittal to ID/IMD/USAID.

Exhibit A ( two sheets ) presents the location and Table I presents the requirements for radio phones, new buildings, and or improvements to existing buildings. The costs of providing eight (8) new buildings cum office facilities for Field Operation Units and thirteen (13) improvements to existing buildings is presented on Table II for your information and necessary action.

We have discussed with Mr.Piyadasa the communications and building requirements for the Systems Operation Plan and he is in agreement with the requirements. Therefore, please formally submit the recommended proposal for the communication network and building requirements to ID/IMD/USAID for approval so that these facilities can be implemented at an early date.

C.F.Leonhardt

Encl.As stated.
cc:S.Piyadasa
D.S.A.Kulasekera

## Improvement to system operations

### Establishment of Field Operation Units and Sub Units

Establishment of Field Operation Units and sub units envisaged in the action plan for improving System Operations, entails construction of new buildings and improvements to existing buildings. The requirements identified by the Divisional I.E.E are listed below.

| Scheme | Field Operation Unit | New Buildings | Estimated Cost | Improvements | Estimated Cost |
|---|---|---|---|---|---|
| P.S.S. | Onegama | T.A.Qrs. | 420,000 | W.S.Qrs. | 30,000 |
| | Divulapitiya | T.A.Qrs. | 420,000 | 2 W.S.Qrs. | 120,000 |
| | Palugasdamana | T.A.Qrs. | 420,000 | W.S.Qrs. | 40,000 |
| | B.O.P. 305 | T.A.Qrs. | 420,000 | W.S.Qrs. | 40,000 |
| | Lankapura | | | W.S.Qrs. | 28,000 |
| | | | | T.A.Qrs. | 15,000 |
| | Sub Total | | 1,680,000 | | 273,000 |
| Giritale | Giritale | T.A.Qrs. | 420,000 | | |
| | Sub Total | | 420,000 | | |
| Minneriya | Divulankadawala | T.A.Qrs. | 420,000 | W.S.Qrs | 50,000 |
| | Hingurakgoda | | | T.A.Qrs | 100.000 |
| | | | | W.S.Qrs | 25,000 |
| | | | | D.A.Qrs | 75,000 |
| | Minneriya | | | T.A.Qrs | 100,000 |
| | Sub Total | | 420,000 | | 350,000 |
| Kaudulla | Medirigiriya | T.A.Qrs. | 420.000 | | |
| | Ambagaswewa | T.A.Qrs. | 420,000 | | |
| | Diyasenpura | | | T.A.Qrs. | 5,000 |
| | | Sub Total | 840,000 | | 5,000 |
| | | Total | 3,360.000 | | 628,000 |

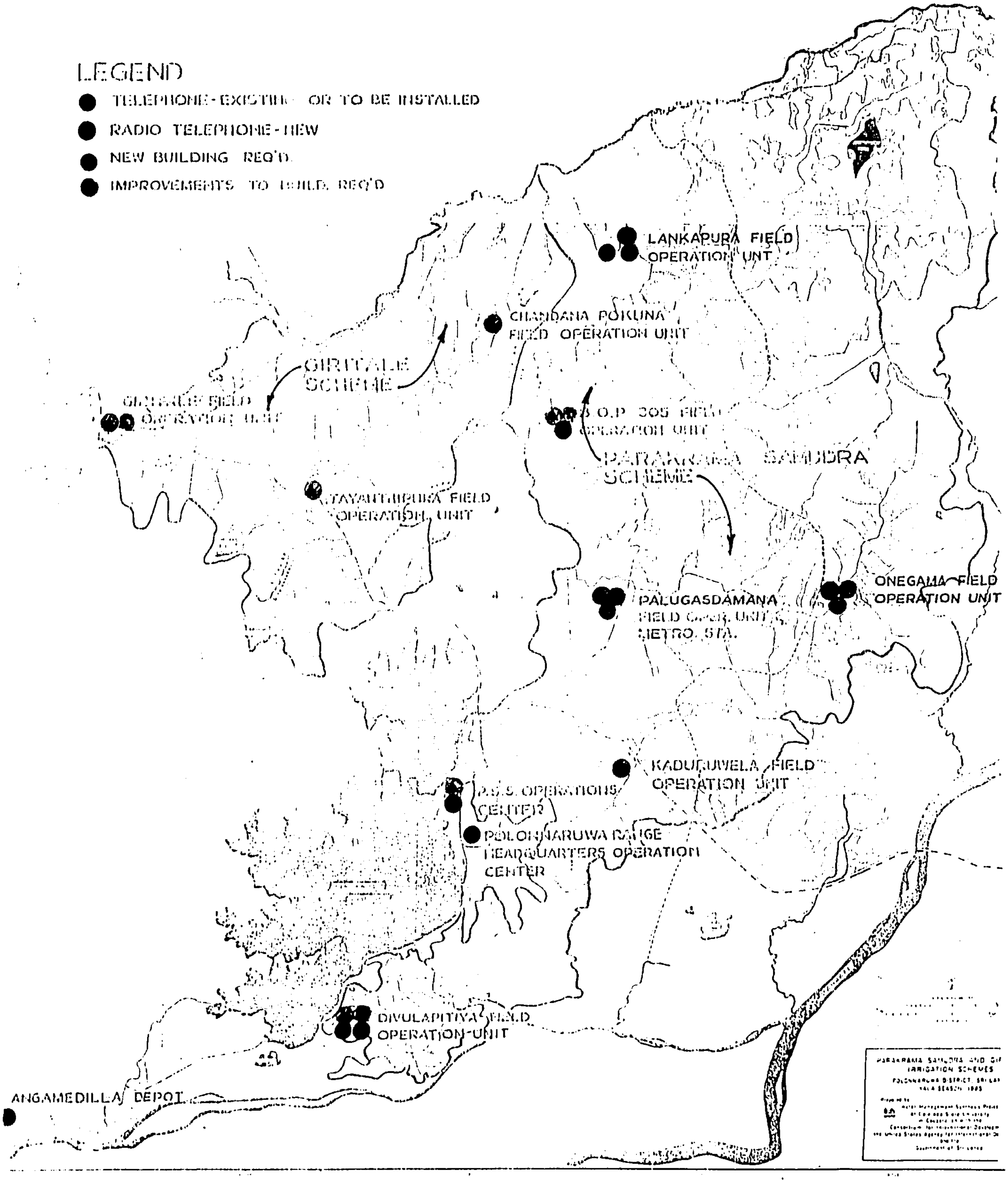
Total cost Rs. 3,988,000

[illegible] BUILDING
IMPROVEMENT REQUIREMENTS

| SCHEME | NAME OF FIELD OPERATION UNIT | NEW RADIO TELEPHONES REQUIRED | NEW BUILDING REQUIRED | IMPROVEMENT TO EXIST. BLDG |
|---|---|---|---|---|
| Kaudulla | Kaudulla Operation Center | 1 | - | - |
| | Medirigiriya Field Operation Unit | 1 | 1 | - |
| | Diyasenapura Field Operation Unit | 1 | - | 1 |
| | Ambagaswewa Field Operation Unit | 1 | 1 | - |
| Sub total Kaudulla | | 4 | 2 | 1 |
| Minneriya/ Giritale | Minneriya/Giritale Operation Center | 1 | - | 2 |
| | Hingurakgoda Field Operation Unit | 1 | - | 2 |
| | Kaudulla Field Operation Unit | 1 | - | - |
| | Divulankadawela Field Operation Unit | 1 | 1 | 1 |
| | Galamuna Field Operation Unit | 1 | - | - |
| | Giritale Field Operation Unit | 1 | 1 | - |
| | Jayanthipura Field Operation Unit | 1 | - | - |
| | Chandanapokuna Field Operation Unit | 1 | - | - |
| Sub Total Minneriya/Giri | | 8 | 2 | 5 |
| P.S.S | P.S.S.Opr. Center | 1 | - | - |
| | Divulapitiya Field Operation Unit | 1 | 1 | 2 |
| | Kaduruwela Field Operation Unit | 1 | - | - |
| | Palugasdamana Field Opr.Unit & Metro.Stn | 1 | 1 | 1 |
| | Onegama Field Operation Unit | 1 | 1 | 1 |
| | B.O.P.305 Field Operation Unit | 1 | 1 | 1 |
| | Lankapura Field Operation Unit | 1 | - | 2 |
| | Angammedilla Depot. | 1 | - | - |
| Sub Total P.S.S. | | 8 | 4 | 7 |
| Total Polonnaruwa RANGE | | 20 | 8 | 13 |

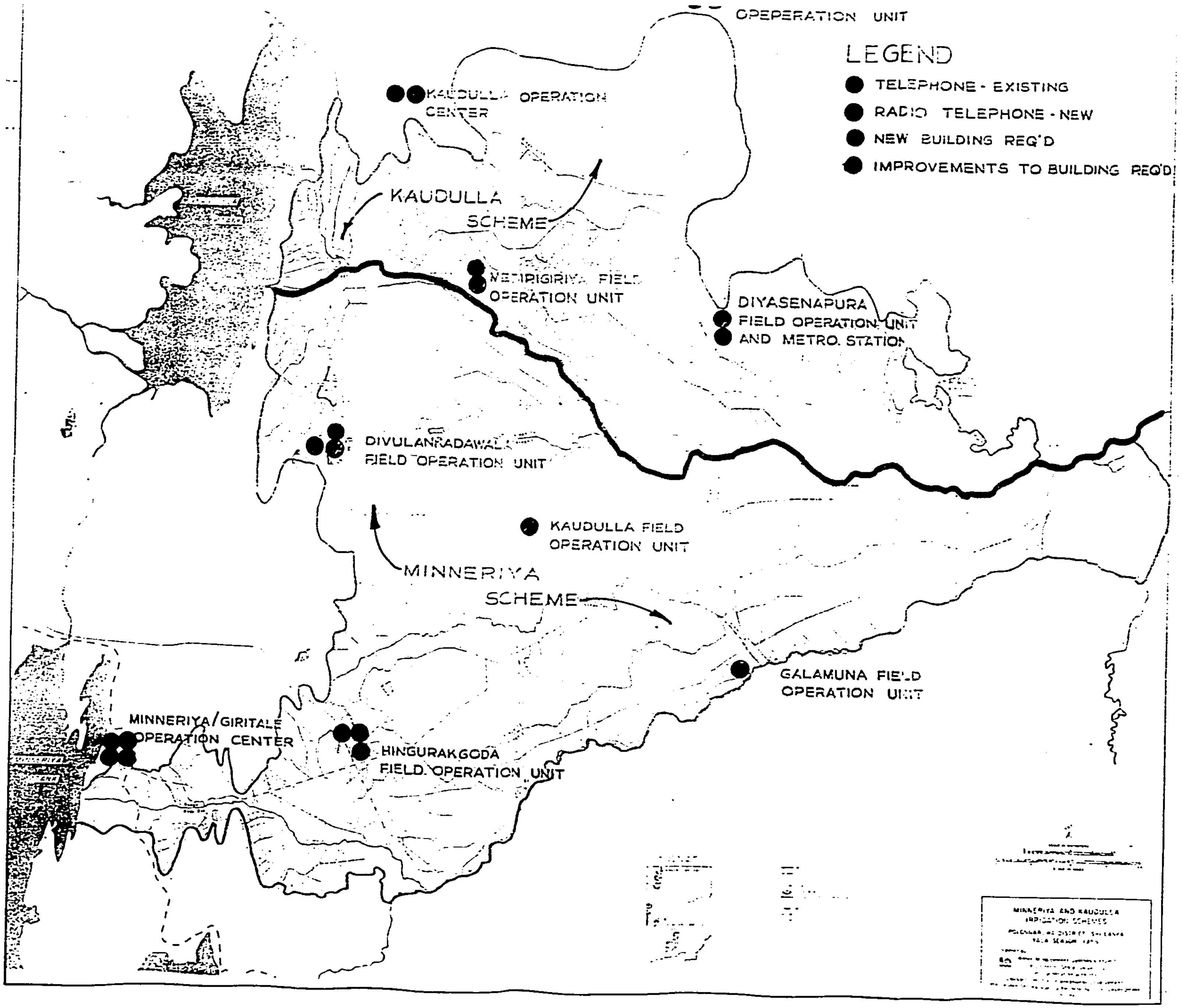
SHEET 1 OF 2

BEST AVAILABLE COPY



Source: Martin, T.C. 1987. Irrigated l
and irrigation distribution o
four schemes in the Polonnaru
of Sri Lanka. Water Management
Project Technical Report. Co
Univ. Fort Collins, CO USA.

Scale: 1:40,000


OPEPERATION UNIT
LEGEND
● TELEPHONE - EXISTING
● RADIO TELEPHONE - NEW
● NEW BUILDING REQ'D
● IMPROVEMENTS TO BUILDING REQ'D
KAUDULLA OPERATION CENTER
KAUDULLA SCHEME
WETIRIGIRIYA FIELD OPERATION UNIT
DIYASENAPURA FIELD OPERATION UNIT AND METRO. STATION
DIVULANKADAWALA FIELD OPERATION UNIT
KAUDULLA FIELD OPERATION UNIT
MINNERIYA SCHEME
GALAMUNA FIELD OPERATION UNIT
MINNERIYA/GIRITALE OPERATION CENTER
HINGURAKGODA FIELD OPERATION UNIT
MINNERIYA AND KAUDULLA IRRIGATION SCHEMES
POLONNARUWA DISTRICT SRI LANKA
YALA SEASON

# CHAPTER VI

## RECOMMENDATIONS

Every effort should be made to implement the water management programs in all of the schemes under ISMP'. These programs which have been developed after study and discussion over the last three years do not aim at creating sophisticated technological show-pieces but are the logical first steps in improving the management of our scarce resources. The ID has the technical expertise and the resources to implement them. Inorder to motivate staff engaged in operations, it is necessary to recognise water management as an important technical field by providing opportunities for advancement in carrier and other benefits for those engaged in it.

The single factor that will have the maximum impact in economising water, is better utilization of rainfall. In order to achieve this the cooperation of the farmers has to be sought through the F.O to advance the cultivation and to repair the ridges so as to retain the rain water at least a few days prior to the commencement of water issues. Setting up of two way communications between the field units and the operation center will greatly facilitate utilization of rainfall.

The schemes in which water management activities will have the most beneficial effects are Kaudulla, RBE, GA1 Oya RB and Giritale. In PSS 100% of the irrigable area is cultivated in both seasons and reduction in water usage will only result in increased tank spillage. Improvèment in water management should therefore be directed towards achieving a more even distribution of water supplies. In Minneriya the Yala duty is less than the theoretical requirements due to re-use of water. Improved water management in the areas commanded by LB main canal and Raja Ela may result in deficiencies in Galamuna Scheme (5000 Ac) which depend entirely on the drainage from irrigated lands in the catchment, necessitating releases to the drainage stream from the main canals.

There should be better coordination between MASL officials responsible for planning allocations and DDI Polonnaruwa Range.

After the water management program is well established it is recommended that bulk water issues be made to the DCO's and a water levy charged based on the seasonal volumetric consumption. This will encourage farmers to minimise wastage and also to change over to OFC in soils more suitable for such crops.

### System Operation Computer Model.

Based on the very limited experience gained on the operation of this model (in Giritale Scheme) it is suggested that the following refinements be effected during future revision or updating of the program.

1. Provide for rotational water issues.

   The present model computes daily water requirements on continuous flow basis. Rotational water issue requirements could be computed with inputs of the rotational cycle N (number of days) and the period of water issue within the rotational cycle I (number of days).

   Rotational water issue requirement = N/I x Qc where Qc = the daily requirement on continuous flow basis.

   Using the present model rotational water issued could be obtained by inputting the factor N/I into the adjustment factor for the relevant node point.

2. Raising the upper limit of effective rainfall.

   The upper limit of effective rainfall Re (daily) has been set at 30mm. Any figure higher than this value is rejected as "too high". This limit should be raised to 100mm to make the program more flexible.

3. Carry over of effective rainfall.

   Provide for carry over of effective rainfall when it exceeds crop water requirements. In the current model effective rainfall is accounted for only on the day after the event. To overcome this limitation rainfall in excess of 17mm (depth required to meet in full the field water requirements) could be input into the computer as separate events occurring in consecutive days. eg. 38mm of rainfall on Tuesday could be input as 17mm on Tuesday. 17mm on Wednesday and 4mm on Thursday.

4. Sorting of nodes.

   Sorting of nodes in system data edit mode under certain conditions leads to disorder. This needs to be refined.

# ANNEXURES

## ANNEXURE N-1

## CALCULATION_OF_MAIN_CANAL_DUTIES_-_LOWLAND_PADDY_

The methodology presented below is an attempt to look at the main system as a whole and to account for main canal discharges using the continuity principle, eliminating the need to resort to cumulative loss factors in the distributary network. The resulting duties are close to the Irrigation Department design norms in vogue during the 1960's but lower than those arrived at from current design criteria.

Considering the system commanded by the main canal as a whole, variations in the storage in farms and in the distributory canal network can be assumed to even out and the daily demand Q. is the quantity of water required to maintain the water table.

Q= Evapotranspiration from crops in command area

+ Seepage and percolation loss from wetted area
+ Wastage (direct discharge into drains)
- Effective rainfall
- reuse

Evapotranspiration = A x ETo x Kc for the areas under different growth stages.

For paddy, crop water requirements are highest during the mid stage when ETo and Kc are a maximum. Further the mid stage lasts for 30 days and therefore it could be assumed that the entire command area is in that stage when the demand is a maximum.

:. Evapotranspiration = AxETo×Kc
A= cropped area.

The wetted area or the effective area for computation of seepage and percolation losses = cropped area + area under liyadda ridges, canals , roadways, drains and pheripheral areas surrounding highlands within or abuting the command area.

Seepage & percolation loss = (P+S) A x f

P = percolation rate
S = seepage rate
f = wetted area factor

In the established irrigation systems the wetted area could be considered as 120 percent of cropped area (vide annexed sheet) ie. f = 1.20

In most of the existing systems there is re-use of irrigation water. Although reuse cannot be quantified without detail water balance studies it can safely be assumed to compensate for wastage arising from direct discharge to the drainage network.

:. Q = A x ETo x Kc + (S+P) A x f
The demand is a maximum during mid stage in Yala (July - Aug) when effective rainfall is negligible and also ETo x Kc is a maximum.

ETo is about 6.5 mm/day and Kc = 1.20

In the Polonnaruwa systems the average value of (P+S) is about 4mm/day. (9 mm/day for RBE well drained, 5 mm/day for RBE ill drained and 2 mm/day for LHG)

:. Q = A x 6.5 x 1.2 + (4 x 1.2 A)
= 12.6 A

Demand = 12.6 mm/day
ie. 1.46 l/s per sec. or 47.9 Ac/cfs

The above is in conformity with historical peak demands during Yala in PSS and Minneriya Schemes.

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# Calulation of Wetted Area

## Canals

| Type | * Length M/ha | Wetted width(M) | Area $M^2$/ha |
|---|---|---|---|
| Main | 2.53 | 30 | 75.9 |
| Branch | 3.50 | 25 | 87.5 |
| Distributary | 12.75 | 12 | 153.0 |
| Field | 30.82 | 7 | 215.7 |
| | | | ----- |
| | | | 532.1 |

## Ridges

Assuming 25mx25m liyaddas, ridge length = 50m
50 m in 625 m^2 ie. 800m/ha

width of ridge = 0.6m area /ha = 480 m^2

## Drainages

a) Length of collector drains which collect drainage directly from the farms is approximately equal to the length of field canal.

width is about 0.6m area/ha = 0.6x30.8 = 18.48 m^2

b) Farm drains
The length of drains within the farm is approximately equal to the length of ridges. ie. 800m/ha

Width of drain = 0.25 m
area/ha = 0.25 x 800 = 200 m^2

c) Secondary drainage lines (Natural).

The length of drainages which feed the main drains can be taken as equal to the length of the D canal ie. 12.7 m/ha

Width of drain = 1.5 m area/ha = 19.0 m^2

Total wetted area = 1250 m^2/ha
= 0.125 ha/ha

Percentage increase in wetted area (over cropped area)

= 12.5%

Allowing for wetted areas surrounding highlands within command area, percentage increase in wetted area could be assumed as 20%.

* These are the average values for the Polonnaruwa Systems.

The demand is a maximum during mid stage in Yala (July - Aug) when effective rainfall is negligible and also ETo x Kc is a maximum.

ETo is about 6.5 mm/day and Kc = 1.20

In the Polonnaruwa systems the average value of (P+S) is about 4mm/day. (9 mm/day for RBE well drained, 5 mm/day for RBE ill drained and 2 mm/day for LHG)

:. Q = A x 6.5 x 1.2 + (4 x 1.2 A)
= 12.6 A

Demand = 12.6 mm/day
ie. 1.46 l/s per sec. or 47.9 Ac/cfs

The above is in conformity with historical peak demands during Yala in PSS and Minneriya Schemes.

## ANNEXURE N-2

## FIELD CANAL DESIGN - FOR LOWLAND PADDY

Main demand is during Mid stage in yala when ETO is high, Kc is a maximum and rainfall is negligible.

ETO = 6.5 mm/day (average daily value for Diyasenpura)
Kc = 1.20
P+S = 5 mm/day

Field water requirement = ETO x Kc + (P+s)
= 6.5 x 1.2 + 5
= 12.8 mm/day
= 1.48 l/s/ha
= 47.2 Ac/cfs

Allowing for a 6% loss in field canal*
Final canal peak demand = 1.57 l/s/ha
= 44.6 Ac/cfs
Say 1.6 l/s/ha or 45 Ac/cfs

Field canal peak demand is calculated on the assumption that the entire command area is in the mid stage which lasts for 30 days.

* Findings of Kaudulla Water Management Study - 1978-83 by Hydraulic Research - Wallingford.

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Annexure N-3

## ADEQUACY OF EXISTING IRRIGATION SYSTEMS TO MEET OFC DEMANDS

An analysis of the adequacy of the existing 3" diameter farm pipe outlets to meet OFC water requirements was made by the Consultant and is presented below:

Maximum demand = 50 mm in 6 days for a 3 Ac allotment, therefore FWR for one irrigation
= 3 x 50/25.4 x 12 = 0.492 Ac ft

Number of hours of water issue with a 3" diameter farm pipe outlet = 35.5 hrs., Say 36 Hrs

For a 2 Ac allotment, FWR for one irrigation = 2x50/25.4x12= 0.32 Ac ft

Number of hours of water issue with a 3" diameter farm pipe outlet = 23.1 hrs Say 24 Hrs.

With a 3" diameter farm pipe outlet the number of 2 Ac allotments that could be irrigated simultaneously from a field canal with a capacity 1 cfs is six. Therefore the entire command under a 1 cfs field canal (about 30 ac) could be irrigated in 3 days.

Based upon the above analysis, 3" diameter farm pipe outlets have adequate capacity to irrigate OFC from the existing irrigation systems in the Polonnaruwa Range.

ADEQIS.CFL

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## REHABILITATION

Rehabilitation is upgradation of an existing irrigation distribution and drainage system with a view to attaining the following objectives.

A. Repair of damages to canals and structures which may have been caused by

a. natural deterioration with the passage of time.

b. inadequate maintenance over the years.

c. deficiencies in the design arising from inadequate data ie: roughness coefficient, seepage and percolation losses, crop water requirements.

d. Operational changes necessitating wide variations from design conditions such as those caused by increases in cultivated extents and overloading of canals designed for continuous flow by operating them on a rotational basis.

e. Encroachment of canal, road and drainage reservations leading to weakening of canal embankments, interference with drainage, erosion of highlands above contour canals resulting in siltation of canals and destabilization of canal slopes.

f. Interference with the operation of the system by unauthorized persons engaged in illicit tapping of water often by damaging canals and structures.

g. Cattle and the movement of carts and tractors across earthen canals.

B. Re-conditioning the systems taking cognisance of the conditions existing at the time of rehabilitation. These may include;

a. changes in extents irrigated under each canal

b. changes in crops cultivated and cultural practices.

c. more realistic values of design data such as crop water requirements, canal losses, roughness coefficients.

d. Observed canal conditions which suggest changes in hydraulic parameters and need for introduction or modification of cross drainage structures, silt exclusion arrangements etc.

C. Updating the system to facilitate operation and maintenance taking advantage of improvements in technology and to meet the demands imposed by improvements in socio-economic conditions of the beneficiaries.

Improvements may include

a. provision of adequate controls such as regulators, weirs and gated outlets to effectively regulate canal flows.

b. measuring devices for monitoring of discharges.

# CONCEPT OF ESI AS APPLIED IN ISMP

Rehabilitation program for the four irrigation systems in Polonnaruwa District has been limited to Essential Structural Improvements (ESI). As interpreted from project paper and practiced during 1987 & 88 and programmed for 89 ESI provides for :

a. installation/improvement of adequate water control structures, which include regulators. weirs, check structures gated outlets at the head of all main, branch, distributory canals and the larger field canals.

b. installation of flow measuring devices to adequately monitor discharges in main, branch and distributary canals and releases to larger field canals.

c. repair, reconstruction or modification of damaged structures

d. construction of additional canal crossings and bathing facilities

e. increasing canal capacities where required by desilting, widening or regrading of canals and modifications to structures.

f. strengthening of canal embankments, stabilizing canal slopes in heavily eroded sections and adoption of preventive measures using cost effective techniques to minimize further deterioration of the system.

In general ESI could be described as stabilizing and upgrading an existing system to meet present day requirements using cost effective techniques while providing adequate control and measuring devices to effectively regulate and monitor distribution of water throughout the system.

ESI do not include:

1. Improvements to road network distributory and field canals along main branch distributary and field canals
2. lining of canals
3. improving the layout of the canal system to eliminate direct issues from distributary canals or to limit lengths or extents commanded by field canals.
4. improving head works of tanks incorporated in the system
5. augmenting canal supplies by tapping drainage streams except those already incorporated into the system by ID with the construction of permanent structures.

ESI.DSK

c. improvement [illegible] [illegible] with the provision of additional canal crossings not only for [illegible] operation & maintenance but to [illegible] the increased transport needs of the beneficiaries.

d. effecting improvements to infrastructural facilities such as field offices, maintenance depots and quarters.

e. establishment or improvements to communication facilities.

g. development and use of computer models for scheduling of water issues.

f. establishment or effecting improvements to facilities for collection of rainfall and other meterological data.

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## IRRIGATION SYSTEM EFFICIENCIES POLONNARUWA REGION

Irrigation efficiencies of the four systems in Polonnaruwa Range are exceptionally high (over 70%). These apparent high efficiencies may be due to the following factors:

1. Re-use of irrigation water.

   In practice reuse takes place in three ways

   a. re use designed for and incorporated in the canal distribution system as in Galamuna Scheme in Minneriya, and the incorporation of small reservoirs within the system which collect drainage from irrigated lands in their catchments eg. Ambagaswewa in Kaudulla, Chandanapokuna in Giritale, Kirimetidamana Wewa in P.S.S., Kuum Pokuna and Divulankadawala Wewa in Minneriya.

   b. Construction of temporary dams across drainage streams and direct diversion of drainage water to fields by farmers.

   c. Entry of drainage from irrigated lands into canals within the system. eg. part of the drainage from Kaudulla stage II directly enter the Low Level Main Canal.

2. Augmentation of canal flows by run off from canal catchments.

   For most of their lengths, Main and Branch canals and some of the D canals are constructed as single bank contour canals, and drainage from their catchments enter the canal system. These inflows while augmenting the canal supplies, help to build up the canal storage when the canal is not in operation specially during the rainy period immediately prior to the start of the Yala cultivation. Giritale RB Main canal is a case in point where the canal catchment inflows builds up the storage in Dambala Wewa and Kadawela Wewa reservoirs. In like manner Minneriya Yoda Ela catchment inflows feed Gangoda Wewa an intermediate reservoir on the canal.

3. Augmentation of irrigation supplies by run off from catchments of small reservoirs and anicuts within the system.

   Run offs from farmlands as well as highlands within the system are intercepted by the reservoirs and diversion structures across drainage streams and are utilized to supplement irrigation supplies.

4, Seepage from the reservoirs contribute to meeting the crop water requirements of lands immediately below them.

Reservoir seepage specially in Parakrama Samudra, Giritale and Kaudulla are substantial and are used directly or indirectly in meeting irrigation demands. In Kaudulla and Giritale reservoirs the seepage water enter the canal system directly and are not accounted for in the reservoir releases. In Minneriya seepage water which enter the main drainage is intercepted by diversion structures and utilised for irrigation.

5. Contiguous extent of over 65000 acs minimises the seepage and percolation losses.

Although the area is commanded by 4 separate schemes the irrigated lands are contiguous and each scheme benefit the other in maintaining the water table, thereby minimising the seepage and percolation losses at the pheripery of each scheme.

6. The presence of a large number of diversion structures across drainages raise the water table, minimising seepage and percolation losses.

Most of the drainage streams have been intercepted by permanent anicut structures or temporary dams. In some cases the same stream is tapped at a number of locations along its passage through the irrigation system. Although these diversions cause drainage problems in the lands immediately above them, they not only help to utilize the stream flow but also raise the water table thereby minimising seepage and percolation losses from irrigated lands.

26/05/89

IRG.DSA