Ministry of Agriculture, Irrigation and Mahaweli Development
Democratic Socialist Republic of Sri Lanka

THE STUDY
ON
INCREASING THE CAPACITY
OF
INTEGRATED MANAGEMENT IN IRRIGATION SECTOR
IN
SRI LANKA

FINAL REPORT

MANUAL FOR THE STUDY PROCEDURE

July 2006

JAPAN INTERNATIONAL COOPERATION AGENCY
NIPPON KOEI CO., LTD.

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Forms

Abbreviation

ADB	Asian Development Bank
ADC	Agrarian Development Committee
AER	Agro-ecological Region
AI	Agricultural Instructor
AO	Agricultural Officer
ARPA	Agricultural Research and Productivity Assistant (former ADPA)
ASC	Agrarian Service Centre
BC, B-Canal	Branch Canal
CAP	Construction Arrangement Phase
CBO	Community-based Organization
CCB	Coconut Cultivation Board
CHP	Construction & Handing-over Phase
CPP	Community Preparation Phase
CRB	Cooperative Rural Bank
CWE	Cooperative Wholesale Establishment
D-Canal	Distribution Canal
DDS	Death Donation Societies
DO	Divisional Officer
DOA	Department of Agriculture
DOAP&H	Department of Animal Production and Health
DOFP	Department of Food Production
DS	Divisional Secretariat
EA	Engineering Assistant
EARP	Extension and Adaptive Research Project
FAO	Food and Agriculture Organization of United Nations
FC	Farmer Company
F-Canal	Field Canal
FCG	Field Canal Group
FET	Field Extension team
FO	Farmers' Organization
FSC	Forward Sales Contract
FTA	Free Trade Agreement
GA	Government Agent
GAP	Granary Area Programme
GB	Govigana Bank
GDP	Gross Domestic Products
GN	Grama Niladhari, Village-level government officials
GOJ	Government of Japan
GOSL	Government of Sri Lanka
HL	High Level (Main Canal in Nachchduwa Scheme)
IA	Irrigators' Association
ID	Irrigation Department
IDO	Institutional Development Officer
IDA	International Development Association
IMAC	Irrigation Management Cell
IMD	Irrigation Management Division

INMAS	Integrated Management of Irrigated Agriculture Settlement (IMD)
IP DOA	Inter Provincial Department of Agriculture
IPHT	Institute of Post-Harvest Technology
IPM	Integrated Pest Management
ITI	Irrigation Training Institute
IWMI	International Water Management Institute
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KVS	Krush Vyapthi Sevaka
LB	Left Bank
LID	Land Improvement Division
LDI	Livestock Development Instructors
LHG	Low Humic Gley
LKR	Sri Lanka Rupee
LL	Low Level (Main Canal in Nachchduwa Scheme)
LLDC	Livestock Development Officer
MAIMD	Ministry of Agriculture, Irrigation, and Mahaweli Development
MANIS	Management of Irrigation Systems
MASL	Mahaweli Authority of Sri Lanka
M/M	Minutes of Meeting
MRRP	Mahaweli Restructuring and Rehabilitation Project
MUP	Mahaweli Upgrading Project
NACS	New Agricultural Credit Scheme
NCP	North Central Province
NCRCS	New Comprehensive Rural Credit Scheme
NECORD	North East Community Restoration and Development Project
NEIAP	North East Irrigated Agriculture Project
NH4-N	Ammonium-N
NIRP	National Irrigation Rehabilitation Project
No3-N	Nitrate-N
NWP	North Western Province
NWS&DB	National Water Supply and development Board
O&M	Operation and Maintenance
OFC	Other Field Crops, meaning all field crops other than paddy rice
PC	Provincial Council
PDAPH	Provincial Department of Animal Production & Health
PDCA	“plan”, “do”, “check”, and “action”
PDOA	Provincial Department of Agriculture
PEACE	Pro-poor Economic Advancement and Community Empowerment Project
PID	Provincial Irrigation Department
PIR	Participatory Irrigation Rehabilitation
PMC	Project Management Committee
PRA	Participatory Rural Appraisal
PTWG	Provincial Technical Working Group
RB	Right Bank
RBE	Reddish Brown Earth
RPM	Resident Project Manager

RRA	Rapid Rural Appraisal
S/W	Scope of Works
SAARC	South Asia Association for Regional Cooperation
SAPTA	SAARC Preferential Trading Association
SAEP	Second Agricultural Extension Project
SMO	Subject Matter Officer
TOR	Terms of Reference
T&V	Training & Visit
US $	United States Dollar
USAID	U. S. Agency for International Development
VB	Veterinary Surgeons
WAPHAULA	New Programme replaced from MANIS (Management of Irrigation System) under ID
WB	World Bank
WHO	World Health Organisation
WM	Water Management
WS	Work Supervisor
WUA	Water Users' Association
WUG	Water Users' Group

Ande	Share cropping arrangements in which smallholders without animals herd and manage a flock on behalf of a larger farmer and in return retain half the offspring.
Anicut	A diversion weir to abstract water from a natural channel
Attam	Labour exchange between farmers
Asswedumized	Bunded and puddled (of land for paddy cultivation)
Chena	Slashing, burning, and shifting cultivation
Ela	Canal (Feeder Canal)
Ganga	River
Grama Niladhari (GN)	Village-level government officials
Jayapalaka	Water Master appointed by FO
Kanna	Season, Maha Kanna: Maha season, Yala Kanna: Yala season
Maha	North-east monsoon season (appox. Oct -Mar.)
Oya, Ara	River
Pola	Weekly fair
Pradeshiya Sabha	Local elected council (at divisional level)
Purana	Old or ancient
Shramadana	Self help / shared labour
Tank	A reservoir storing water for irrigation
Thattumaru	Land tenure system operated on rotation basis
Wewa	Water tank
Yala	South-west monsoon season (approx. Apr. - Sept.)
Yaya	Paddy field

Measurement Unit

Extent

cm^2 = Square-centimetres (1.0 cm x 1.0 cm)
m^2 = Square-meters (1.0 m x 1.0 m)
Km^2 = Square-kilometres (1.0 Km x 1.0 Km)
a. = Acre or Acres (100 m^2 or 0.1 ha.)
ha. = Hectares (10,000 m^2)
ac = Acres (4,046.8 m^2 or 0.40468 ha.)

Length

mm = Millimetres
cm = Centimetres (cm = 10 mm)
m = Meters (m= 100 cm)
Km = Kilometres (Km = 1,000 m)
Inch = 2.54 cm
ft = foot (0.3048 m)
mile = 1,609.34 m

Currency

US$ = United State Dollars
J¥ = Japanese Yen
Rs. = Sri Lankan Rupees

Volume

cm^3 = Cubic-centimetres (1.0 cm x 1.0 cm x 1.0 cm or 1.0 m-lit.)
m^3 = Cubic-meters (1.0 m x 1.0 m x 1.0 m or 1.0 K-lit.)
lit. = Litre (1,000 cm^3)

Weight

gr. = Grams
Kg = Kilograms (1,000 gr.)
ton = Metric tonne (1,000 Kg)
MCM = 1,000,000 cu-m = 810.68 acre-ft
ac-ft = 1,233.83 m3

Time and Others

sec. = Seconds
min. = Minutes (60 sec.)
hr. = Hours (60 min.)
cusec. = 28.32 lit/sec
cu-m/s = 35.31 cu-ft/sec

Exchange Rate

As of July, 2006
US $ 1.00 = ¥ 116.32
LKR 1.00= ¥ 1.120

Chapter 1

CHAPTER 1 INTRODUCTION

1.1 General

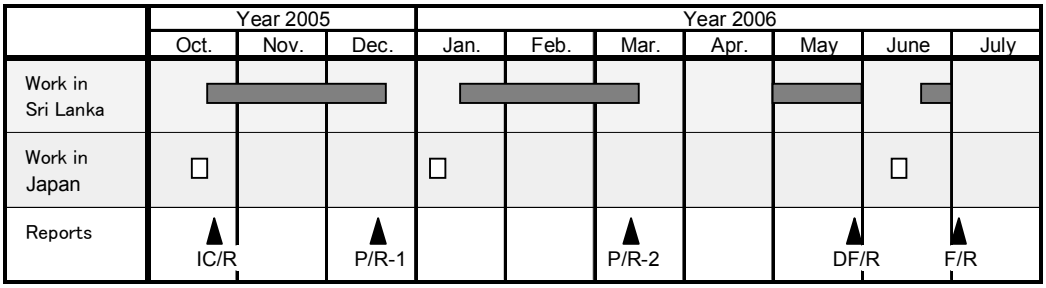
This manual titled “Manual for the Study Procedure” has been prepared in accordance with the Scope of Work (S/W) for “the Study on Increasing the Capacity of Integrated Management in Irrigation sector in Sri Lanka (hereinafter referred to as the Study)” agreed upon by the Ministry of Irrigation, Mahaweli and Rajarata Development (MIMRD), the Government of Sri Lanka (GOSL) and the Japan International Cooperation Agency (JICA) on July 6, 2005.

The Study aimed:

(1) To formulate a plan to increase the capacity for integrated management of the officials belonging to the Irrigation Management Division (IMD), the Department of Irrigation (ID) and other relevant government officials engaged in the irrigation sector (hereinafter referred to as “the Officials”).
(2) To formulate a plan to increase the capacity of FOs for integrated management, and
(3) To strengthen the planning capacity of counterpart personnel engaged in the management of the irrigation sector in the process of the implementation of the Study.

The Study areas were Nachchaduwa and Rajangana major irrigation schemes as core areas with several neighboring medium and minor schemes. Minor irrigation schemes were included for the study area particularly to identify and learn the best practices available at present.

The Study has been carried out over 10 months from October 2005 to July 2006 as outlined in the schedule below.



The Study was conducted in the following manner:

1) To conduct a survey to grasp the present situation and activities of the Officials and relevant FOs

2) To collect data and information to analyze the following items:
   (a) Operation and maintenance of irrigation facilities
   (b) Water management
   (c) Farming practices, input supply and agricultural machinery

(d) Value adding

(e) Credit to farmers

(f) Marketing of agriculture products, and so on

3) Identify the constraints, formulate plans, and examine using participatory approach.

4) Formulate an appropriate plan to increase the capacity of integrated management of the relevant Officials and FOs.

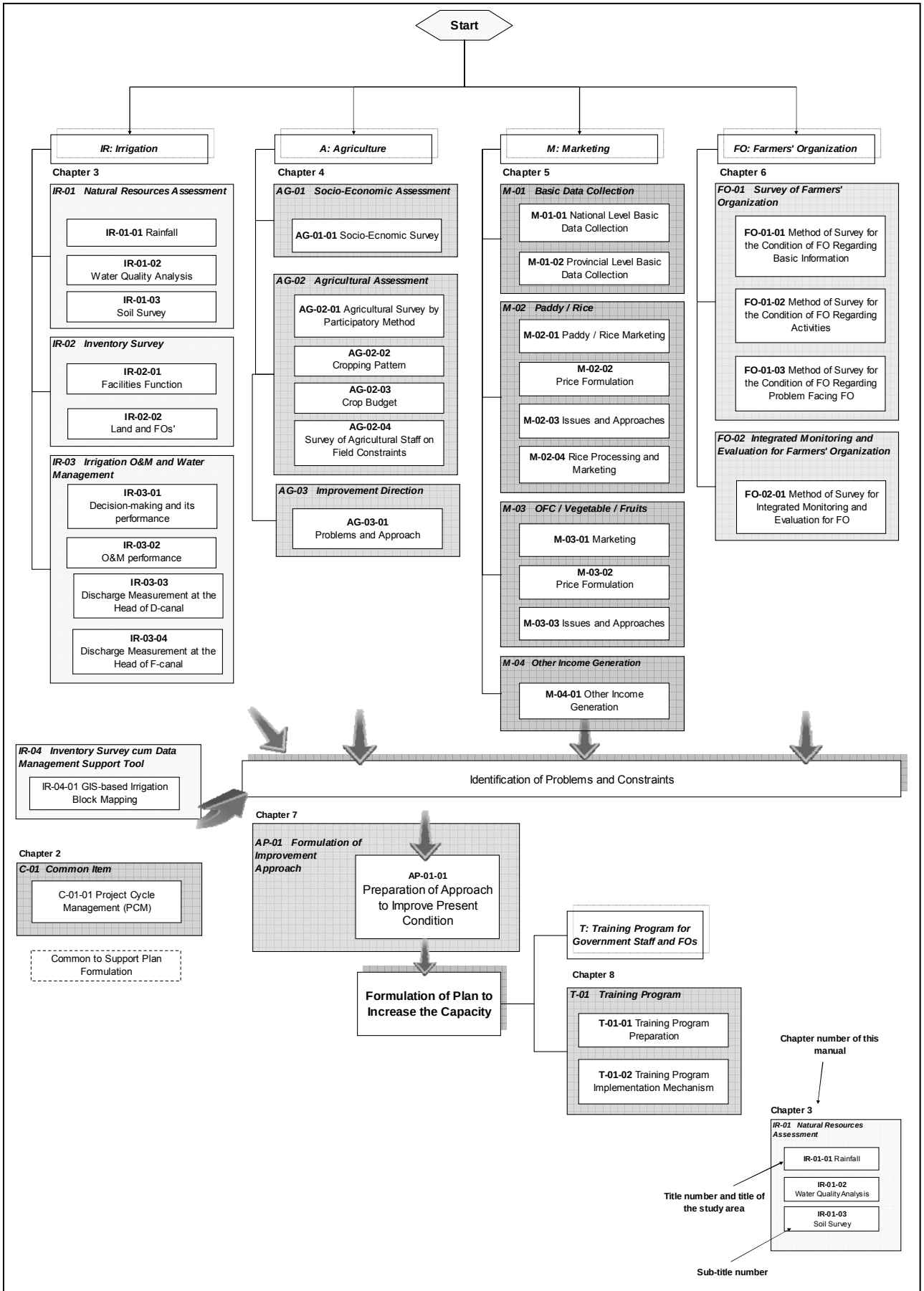
Ministry of Agriculture, Irrigation and Mahaweli Development was the Executing Agency and the counterpart agencies for the Study are IMD and ID. A National Steering Committee consisting of members from the relevant agencies of GOSL and GOJ has been set up under the Ministry of Agriculture, Irrigation and Mahaweli Development for the smooth and effective implementation of the Study, while a Regional Steering Committee and Working Groups have been set up at the regional and Project level.

1.2 Objective of the Manual

The manual was prepared according to one of the important purposes of the Study: to increase the capacity of the Officials involved in integrated management in irrigation sector; therefore, the prospective users of this manual are these Officials primarily field staff engaged in irrigation projects. The objectives of this manual are i) to compile planning procedures to develop the plan for increasing the capacity of integrated management, ii) to provide and transfer technical know-how, and iii) to contribute to the increase of capacity of both the Officials and FOs involved in integrated management in the irrigation sector.

1.3 Contents of the Manual

The manual is prepared for each important subject: irrigation, agriculture and marketing related to the irrigation sector. However, some are cross-cutting issues, some of which are explained separately from those independent sectors. The following figure shows the contents of the manual.



The Procedure to Develop the Plan to Increase the Capacity of Integrated Management in Irrigation Sector

The manual consists of eight chapters. Chapter 1 introduces the objective of the manual on the basis of general information and background of the Study. Chapter 2 deals with common issues consisting of workshop organization. In particular, the JICA study adopted Project Cycle Management (PCM) method for the organization of workshops during the Study; therefore, this method is elaborated in this chapter.

Chapter 3 explains the subject of irrigation consisting of natural resources assessment, inventory survey for irrigation facilities, irrigation water management and brief explanation on GIS-based irrigation block mapping as one of the tools for presenting situation analysis as well as supporting alternatives for irrigation development and management, which are proposed in the Study.[1]

Chapter 4 describes the subject of agriculture dealing with the methodology of socio-economic survey and agricultural assessment, including participatory approach. The recommended questionnaire format is also attached; therefore, this would be a useful reference for those who are involved in agricultural surveys.

Chapter 5 delivers topics related to marketing. This subject starts from the confirmation of the marketing environment, such as basic data collection at the national and provincial level, such as imports and exports as well as consumption, rates of import tariff, agricultural commodity prices and so forth. Then, marketing flow for specific products consisting of paddy, OFC, vegetables and so forth. Out-sourcing would be a likely option for these surveys, therefore, technical specifications are attached for future reference.

As an actor of implementing irrigated agriculture, Chapter 6 covers planning procedure for increasing the capacity of integrated management for FOs. The contents mainly focus on survey methodology of FOs, consisting of the collection of basic information, activities and current problems.

Corresponding to each sectoral study on present situation and constraints as mentioned above, improvement approach to overcome such constraints is considered and summarized, which is explained in Chapter 7. Some visualized approach would be often useful to understand the complicated linkages between constraints and approaches; therefore, examples prepared under the Study are introduced here.

Finally, based on the discussion and problem identified using the method explained in the preceding chapters, the procedure for formulation of training programs for the Officials and FOs is provided in Chapter 8.

[1] As for GIS, Annex-E has been prepared for elaborating database construction method as well as future application. In this manual, therefore, general overview of the database is briefly introduced. Those who are interested in details are recommended to refer Annex-E of the Final Report.

1.4 How to Use this Manual?

This manual is a concise reference to help users get involved in substantial planning and design for enhancing capacity for integrated management in the irrigation sector. Each task is summarized on a double-page spread in enough detail for readers to understand how it works and decide whether to pursue it further. Tabular form in the first half summarizes important information of the work including (i) purpose, (ii) working group, (iii) output, (iv) work procedure, (v) necessary materials and sample formats followed by supplemental information such as theoretical background, pictures and sample output. On the next few pages, the general format of this manual are set out.

MANUAL FORMAT

Title of the Study Area

IR-03	Irrigation O&M and Water Management
Sub-title	Water Management Decision-Making Process and its performance
Purpose	➢ Identification of the organization's formal and informal m… water management ➢ Interpretation of what is required as a result of these mandates (leading probably to explicit goals or performance indicators) ➢ Identification of decision-making process to clarify weak … and/or the area improvement is required in irrigation wate…
Working	➢ Irrigation Engineer (IE) Engineering Assistant (EA) Farmers' Organization ➢ Other organization related with this process
Output	➢ Water management Decision-Making Process Flow and its function in various stages
Work Procedure	(1) ***Data Collection***: Necessary data should be collected for this study such as legal backing related with irrigation (Irrigation Ordinance and Mahaweli Regulation), rotational irrigation schedule, monitoring and evaluation re… Kanna Meeting and/or Project Management Committee (PM… (2) ***Identification of mandates of each stakeholders***: Differe… takeholder has different mandates in appropriate irrigation wate… management. Based on the collected data, such responsibilities are identified and prepare decision-making process flow. In this process, clarification of what is not rule… mandates also important analysis factor, meaning that the roug… the organization's unconstrained field of action. O&M including … management of main facilities are depended on the government … D- and F-canal level facilities are by FOs is one of them. (3) ***Identification of weak points or constraints***: Based on the pro… flow, weak points or constraints attributed to capability of certain org…zation and/or ineffective work process. Performance measurement in irrigation water management would be effective in this process (see the tabl… in the next page).
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** …nder perspectives are required for this study. Following mate…s are, therefore, essential requirements but not necessarily sufficient, which are depending upon irrigation schemes. ➢ Legal backing related with irrigation such as Irrigation Ordinance and Mahaweli ➢ Rotational irrigation schedule prepared by each scheme ➢ Monitoring and evaluation record **FORMATS** ➢ See below as a sample of decision-making process flow

The method's main use and strength

Related parties to be involved in the study

The information, results etc. produced by the study

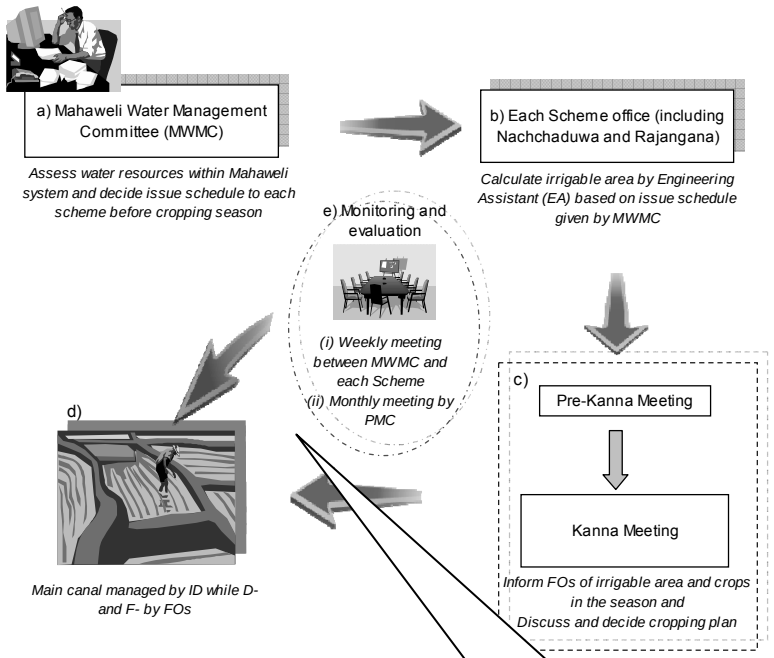
The method's general work flow

Sample forms and other information, things to remember

Pre-arrangement and equipment necessary

Sample of Water Management Decision-making Process

Some examples of the irrigation water management decision-making process with description for some of the irrigation schemes within the Mahaweli system are shown below:

Description	Flow
a) The MWMC assesses water resources within the Mahaweli system. The committee decides water distribution schedule in a seasonal Water Panel Meeting,. b) Each office roughly calculates the irrigable area in the season. 5 acre feet/acre (Maha) and 7 acre feet/acre (Yala) are generally utilized as the unit water requirement. c) Through the series of "Pre-Kanna" and "Kanna" Meeting (seasonal cultivation meeting), cultivation schedule to finalize cultivation schedule. d) Water issue among main system is managed by ID while D- and F-system is by FOs. e) Water issue practice is regularly monitored by WIL under instruction of EA and WS. Meetings are also held (i) MWMC meets with each scheme office (weekly), and (ii) Project Management Committee (PMC) meets monthly.	 **Water Management Decision-Making Pro… Major and Medium Irrigation Sch…**

Any supplementary information, images and/or explanatory photos from the JICA Study

Irrigation Water Management Performance Measurement

Some guidelines on measuring the performance of water management are tabulated below:

Performance Measurement Indicator and Parameter for Irrigation Water Management

		Indicator	Parameter
1	Water Distribution	Equity	Amount
			Quality
			Percentage of area actually irrigated
			Percentage of farm lots with adequate water
		Reliability	Timeliness
		Opportunity	Quantity
2.	Efficiency … system performance	Water use efficiency	Water productivity (yield per cubic meter of irrigation water)
		Access to water in relation to rights	Indices of irrigation water utilization

Helpful hints to carry out the study

Tips

(1) Not only engineering aspect, legal backing is important for all the field staff related with irrigation to identify constraints of water management thereby proposing increasing the capacity in integr…

Where to find more details or relevant information
⇒ Method pages with related information,
⇒ Title of related publication

FURTHER INFORMATION

⇒ Final Report Chapter 3 Irrigation O&M and Water Management
⇒ Annex-A Irrigation O&M and Water Management (legal backing in Chapter 1 and water management in chapter 3)
⇒ IR-03-02 Operation and Maintenance and its Performance

Chapter 2

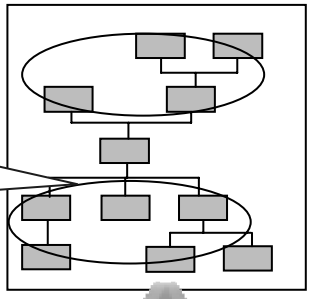
<table>
<tr><td>C-01</td><td colspan="2">Common Item</td></tr>
<tr><td>C-01-01</td><td colspan="2">Project Cycle Management (PCM) Workshop</td></tr>
<tr><td>Purpose</td><td colspan="2">➢ Identification of problems and constraints in target irrigation schemes and associated cause-effect relationships
➢ Deriving needs of participants and approach toward improvement
➢ Preparation of implementation schedule</td></tr>
<tr><td>Working Group</td><td colspan="2">➢ Depending upon the purpose of workshop (government staff, from head office and/or field staff, from irrigation, agriculture and/or other relevant organizations, member of Farmers' Organizations and so on)</td></tr>
<tr><td>Output</td><td colspan="2">➢ Problem, constraints and cause-effect relationships
➢ Project Design Matrix (PDM)
➢ Implementation schedule</td></tr>
<tr><td>Work Procedure</td><td colspan="2">PCM workshop procedure is described as follows and visually illustrated in the next page.
(1) Participation Analysis: People, groups, and organizations which would be affected by the development project are analyzed. The analysis generally consists of the following steps: (i) record all the persons, groups, organizations, and institutions related to or affected by the project, (ii) categorize the groups, (iii) select several groups that are important to the project, (iv) analyze the characteristics of each group, and (v) select a target group.
(2) Problem Analysis: Problem analysis visually organizes "cause and effect" relationships of the existing problems of the sector. (i) Firstly a core problem, most focal problem agreed by all workshop participants, is then selected. (ii) Write core problem on a card and place it in the centre of the board. Then identify substantial and direct causes of the core problem. (iii) Add the causes for each problem and work downward to form the shape of a tree (develop cause-effect relationship).
(3) Objectives Analysis: In the objective analysis, the problem tree is transformed into an objective tree that describes the actions required to solve the problems and the effects of the solutions. By rewording the negative "cause-effect" relations of the problems tree into the positive "means-ends" relations, "desirable future conditions" can be attained.
(4) Alternatives Analysis: This analysis aims to identify the project components by grouping branches. Through this practice, one or combined branches can be an independent approach such as facilities' rehabilitation, training and so on.
(5) Project Design Matrix (PDM): The result of preceding exercise can be summarized in PDM similar to a logical framework.
(6) Plan of Operation: The plan of operation (or implementation schedule) is what the project implementors of both donor and recipient countries prepared based on the PDM. Such information is elaborated as activities, expected results, schedule, parties responsible input and necessary condition.</td></tr>
<tr><td>Necessary Materials and Sample Formats</td><td>NECESSARY MATERIALS
➢ Flip chart, writing card, pen
➢ Other equipment and supplies (stationery and so forth)</td><td>FORMATS
➢ FORM-1 PDM
➢ FORM-2 Plan of Operation
➢ See next page</td></tr>
</table>

Project Cycle Management

The PCM procedure is visualized as follows:

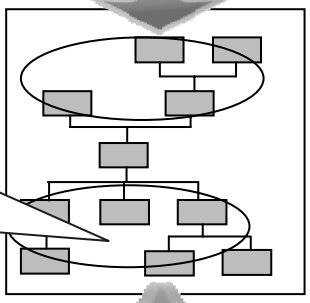
Problem analysis (see Figure C.1)

Place the substantial and direct causes and effects to develop the problem tree.



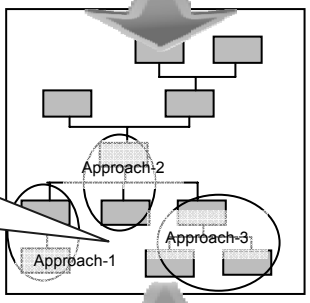
Objective analysis (see Figure C.2)

Develop objective tree by transforming problem tree to describe the means for solving the problems and the effects of the solutions.



Alternative analysis

Group one or more branches to prepare independent approach to achieve objectives



Project Design Matrix (PDM)

Project Summary	Indicator	Important assumption
Overall goal		
Project purpose		
Outputs		
Activities	Inputs	
		Pre-conditions

Images on PCM Workshop

Problem analysis workshop held by gathering the members of the steering committee in January 2006. The issue raised from the workshop extended to: (i) Agriculture, (ii) Farmers' Organization, (iii) Irrigation & Water Management, (iv) Marketing, (v) Institution and (vi) Off-farm income activities.

Plan of Operation

Activity	Output	Schedule	Respon sibility	Impleme ntor	Equip ment	Cost
A						
B						

Tips

(1) During core problem selection, if the participants cannot agree on the core problem, select tentatively one problem and continue working. Then return to the discussion on the core problem later.
(2) Every cause-effect relationship does not automatically become a means-end relationship.
(3) Adding necessary cards or deletion of logically unsuitable cards is permitted based on agreement among participants.

Source: FASID (1999)

FURTHER INFORMATION

⇒ Final Report Chapter 3 Problem Analysis Workshop
⇒ Foundation for Advanced Studies on International Development (FASID). (1999) Project Cycle Management (PCM) Management Tool for Development Assistance

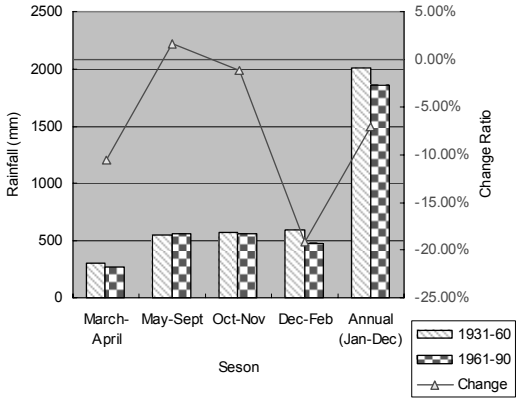
Chapter 3

IR-01	Natural Resources Assessment	
IR-01-01	Long-term Trend of Rainfall	
Purpose	➢ To assess whether the long-term trend of rainfall is increasing or decreasing to obtain guidelines for planning increases in the capacity of integrated development	
Working Group	➢ Irrigation Department (ID) Head Office ➢ Irrigation Engineer (IE) ➢ Engineering Assistant (EA)	
Output	➢ Long-term trend of rainfall in the scheme ➢ Direction of development approach as well as plan for increasing the capacity	
Work Procedure	(1) ***Inventory of rainfall data***: The availability of rainfall data differs among stations. Amount of rainfall, location of the station, and type and period of observation are determined. Then usable data are selected. (2) ***Collection of existing analysis result and reports***: Hydrological and meteorological analysis has been carried out by various organizations. Therefore, such analysis results can be utilized for the study. For instance, "*Water Resources and Climate Change*" prepared by Initial National Communication (INC) on Climate Change in 2000 would be a useful guideline. (3) ***Analysis by comparing previous and recent rainfall data***: Long-term averages (30 years or so) are compared between previous and recent periods to identify trends. Residual curve preparation is also an orthodox way of carrying out this analysis (see tips below). (4) ***Long-term Trend –increasing or decreasing?***: The result is utilized as the basis for whether paddy or OFC is promoted from the view point of water resources availability. Such broad direction should be incorporated into plans for increasing the capacity in integrated management.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Location of meteorological station ➢ Rainfall data	**FORMATS**

Why is water resources assessment required for the formulation of plans to increase the capacity in integrated management in irrigation sector?

Formulation of plans to increase the capacity in integrated management depends on various factors from physical, organizational to institutional aspects. An interdisciplinary, broader outlook is required. Irrigation management development and management is dependent on available water resources in each scheme. It should be noted that water availability cannot necessarily and completely determine the area to be cultivated. in Alto depends on local knowledge in managing irrigated agriculture. However, water resource availability is an imperative guideline in plan formulation.

In actuality, such water resources assessment study in Sri Lanka is currently available from various institutions. The JICA Study found reports by Jayatillake et al. (2004) that average annual rainfall decreased by 7% from 1931-60 to 1961-90. In addition, according to district-wise analysis, rainfall has reduced nearly 150 mm annum in Anuradhapura district.



Prepared by the Study Team based on Jayatillake et al. (2004)

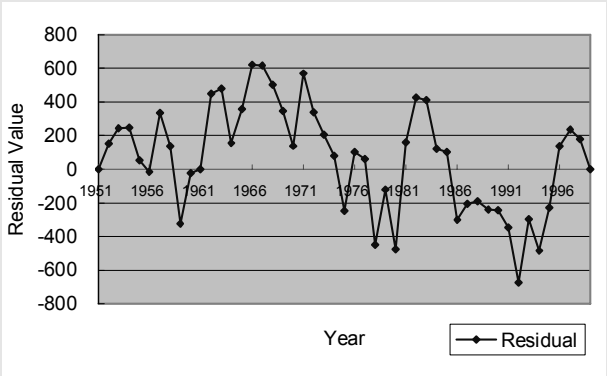
Rainfall Long Term Trend Seasonal Basis (Periods: 1931-60 & 1961-90)

Tips

Preparation of a ***residual curve*** is one methodology for identifying long-term trends in water resources availability. The procedure is explained as follows:

(1) At first, obtain a long period of rainfall data and derive long-term average values. For each period that you wish to examine you subtract the long term average value. This gives us a residual.

(2) Based on the preceding steps, a cumulative plot is created. To do so, add together the residual values over time and graph them against time.



Prepared by the Study Team

Rainfall Mass Residual Curve (Vientiane, Lao: 1951-1999)

(3) Where the slope of the curve is increasing (positive residual values), rainfall exceeds the long term average meaning wetter periods. On the other hand, where the slope of the curve is declining (negative residual values), it means generally drier periods.

(4) A sample residual curve is shown above using the data of Vientiane in Lao PRD. The curve shows that between the year 1951 to 1985, rainfall shows an increasing trend (increasingly positive residual values), while from 1986 to 1995 the reverse trend is shown. An increasing trend appears again after 1995.

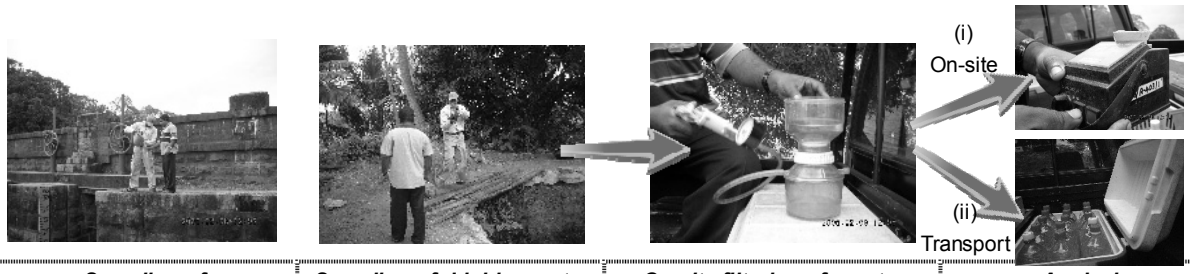
FURTHER INFORMATION

⇒ Final Report Chapter 3 Irrigation O&M and Water Management

⇒ Annex-A Irrigation O&M and Water Management

⇒ Jayatillake et al. (2004). Jayatillake, H M, Lalith Chandrapala, B. R. S. B. Basnayake, and G. H.P. Dharmaratne. 2004. *Water Resources and Climate Change*

IR-01	Natural Resources Assessment	
IR-01-02	Water Quality Analysis	
Purpose	➢ To assess the impact of irrigated agriculture practices on irrigation and drinking water quality ➢ To prepare the approach to mitigate such impact	
Working Group	➢ Farmers' Organization (FO) Water Master and some representatives from FO (FO) ➢ Engineering Assistant (EA), Work Supervisor (WS) and Water Issue Laborer (WIL) ➢ Institutional Development Officer (IDO)	
Output	➢ Water quality analysis result ➢ Impact mitigation plans	
Work Procedure	(1) ***Measurement point selection***: Sampling sites depend on the characteristics of the sites and requirements. However, they generally consist of (i) main inflows to tanks, (ii) tanks themselves, (iii) main canals, (iv) return flow and (v) drainage (see illustration below). (2) ***Prameters***: Parameters are selected for both irrigation and drinking water based on the relevant standards and guidelines (refer FURTHER INFORMATION and FORM-3). (3) ***Analysis***: Some parameters can be analyzed on site while others are done in the laboratory. The former include temperature, electric conductivity (EC), alkalinity, dissolved oxygen, and pH. (4) ***Share information and mitigation plans***: Analysis results should be shared among stakeholders consisting of government field staff and FOs' members. If any adverse impacts are found, the results should be shared among the relevant parties of the Project Management Committee (PMC) and mitigation measures prepared.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Water quality analysis kit	**FORMATS** ➢ FORM-3 Water Quality Analysis Specification

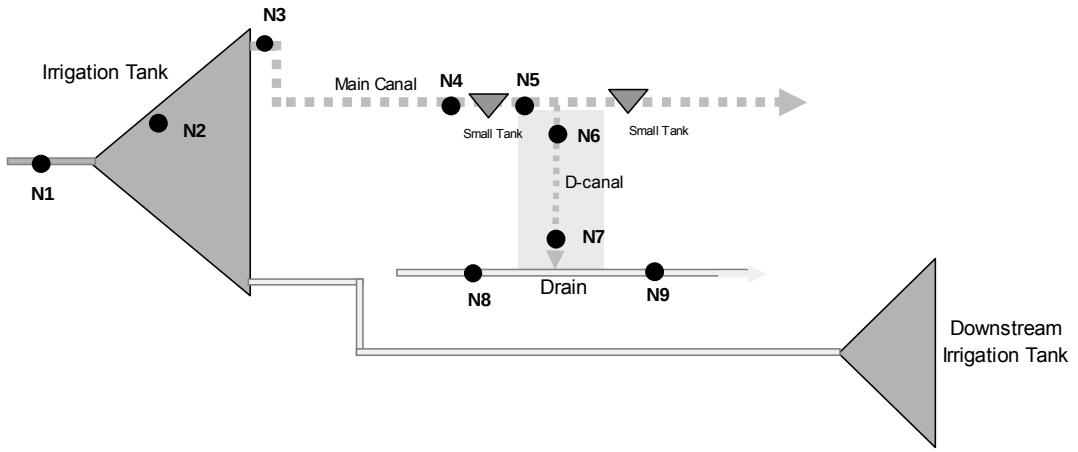


Sampling of irrigation water	*Sampling of drinking water*	*On-site filtering of water*	*Analysis*
Water samples are collected in unused (brand new) mineral water bottles using a clean plastic bucket		*Water samples are filtered through membrane filter papers using a suction filter apparatus*	*(i) On-site analysis and (ii) storage of samples for transportation*

Water Quality Analysis procedure

Sampling Sites Selection

In order to monitor impacts given by irrigated agriculture, the following points would be, in principle, selected as water sampling sites.



N1: Main Inflow to irrigation tank
N2: Tank
N3: Outlet from the tank (beginning of main canal)
N4: Inlet to small tank
N5: Outlet of small tank
N6: Beginning of D-canal
N7: End of D-canal
N8: Drainage (before the confluence of drain and D-canal
N9: Drainage (after the confluence of drain and D-canal

Schematic Diagram of Water quality analysis sampling points

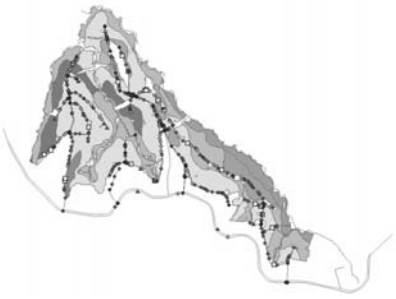
Tips

(1) Some parameters are more difficult to analyse; therefore, sub-contracting is one alternative to carry out water quality analysis. FORM-3 can be a helpful reference for the arrangement of sub-contract works.

(2) FAO Irrigation and Drainage Paper No. 29 indicates that the potential adverse impacts caused by irrigated agriculture are: (i) salinity, (ii) infiltration rate, (iii) specific ion toxicity, and (iv) miscellaneous effects including nitrogen. Water quality analysis parameters should therefore be selected considering such issues.

FURTHER INFORMATION

⇒ Final Report Chapter 3 Water Quality Analysis
⇒ Annex A Irrigation O&M and Water Management (Attachment-2)
⇒ Van der Leeden, F. Troise, F.L. & Todd, D.K. 1990. Geraghty & Miller Ground Water Series: The Water Encyclopedia (Second Edition), Lewis Publishers. NY, USA.
⇒ Ministry of Agriculture, Forestry and Fisheries (MAFF), Research Committee on environmental pollution. 1970. Japanese Water Quality Standard for Paddy Field, MAFF, Tokyo, Japan
⇒ Draft Sri Lanka Standard. 2006. Guidelines for the surface and ground water quality for designated uses of river basins in Sri Lanka Part 1 : Kala Oya Basin , Sri Lanka Standard Institute. Colombo, Sri Lanka.
⇒ WHO. 1989. Guidelines for Drinking Water Quality. Vol 1. Recommendations. WHO, Geneva, Switzerland.
⇒ FAO. 1985. Water quality for agriculture, Irrigation and Drainage Paper No.29 Rev.1 FAO, Rome, Italy.

<table>
<tr><td>IR-01</td><td colspan="2">Natural Resources Assessment</td></tr>
<tr><td>IR-01-03</td><td colspan="2">Soil Survey</td></tr>
<tr><td>Purpose</td><td colspan="2">➢ To obtain the soil texture classification so as to get guidelines on the future direction of the cropping plan</td></tr>
<tr><td>Working Group</td><td colspan="2">➢ Agricultural Instructor (AI)
➢ Engineering Assistant (EA)
➢ Institutional Development Officer (IDO)</td></tr>
<tr><td>Output</td><td colspan="2">➢ Soil survey result
➢ Guideline for future cropping plan</td></tr>
<tr><td>Work Procedure</td><td colspan="2">Soil survey is defined as an inventory of the soil resources of an area. The output of survey consists of soil texture classification together with interpretation such as fertility and drainage class.
(1) Classification with Mapping Units: Prior to the survey, mapping units should be determined based on the Sri Lankan standard (see the table below). Through the works explained below, the soils are classified, named and delineated on a map as bodies of soil in a landscape.
(2) Measurement point selection: A grid with an interval of 250 m is drawn over the target area and intersecting points are selected as sampling points.
(3) Observation: Holes are dug at each sampling point to examine the soil. Observations of color, texture, structure, and other characteristics of the different layers are noted. The soil profile, a vertical section of soil through all horizons, at each hole is compared with other soil profiles in the area.
(4) Drawing soil maps: Soil maps are drawn based on the field survey results. The JICA Study prepared maps at a scale of 1:5,000.
(5) Preparation of proposed cropping plan: Different texture classes are suitable for different crops (see the table below). A cropping plan is proposed based on the soil survey result. An outline of a soil survey report is shown in FORM-4.
 
Soil map of Rajangana LB Tract 2: nearly 40 % of the area is dominated by well-drained RBE, therefore, there would be a possibility in promoting OFC and vegetables.</td></tr>
<tr><td>Necessary Materials and Sample Formats</td><td>NECESSARY MATERIALS
➢ General layout
➢ Soil survey kit
➢ GPS
➢ Measuring tape</td><td>FORMATS
➢ FORM-4 Outline of Soil Survey Report</td></tr>
</table>

How to utilize soil survey result?

The texture classification results can be utilized for crop planning in the scheme. The legend for the texture classification with land use recommendations utilized in the JICA Study is tabulated as follows (details of which are shown in Appendix E):

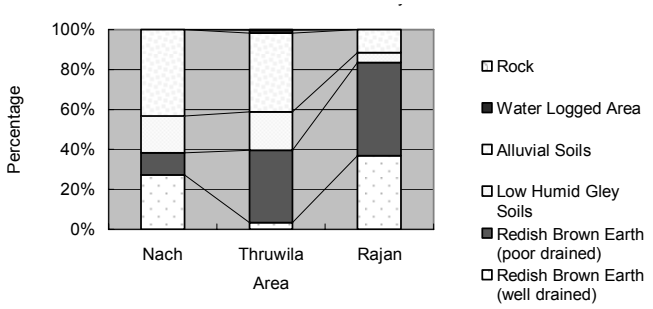
Soil Mapping Unit and Its Description

	Legend	Description	Land Suitability	Land Use Recommendation
1.	WD	Well drained reddish brown earth (RBE)	U1	If supplemental water supply by irrigation, deep rooted perennial crops such as mango, banana, papaya, cashew and citrus is recommended.
2.			U2	Similar to U1, same kinds of crops would be proposed, however, particularly for Yala season
3.			U3	Annual crops such as onion, tomato, chilies, wild rice, sunflower, peanut, maize, green gram, soybean with drip/sprinkler irrigation
4.	MWD.d	Moderately well drained deep RBE	U1	As described above.
5.	I.d	Imperfectly drained deep RBE	U5R2	Annual crops such as onion, tomato chilies etc. are recommended subject to adequate drainage facilities.
6.	LHG.d	Deep low humid gley (LHG) soil	U5R1	Similar to U5R2. If crop diversification is not promoted, wetland rice with supplemental flood irrigation and with Yala season flood irrigation is recommended.
7.	LHG. vpd. d.		R1	Wetland rice in Yala with supplemental irrigation and in Maha with flood irrigation
8.	Al.d.	Deep alluvial soil	U5R1	As explained above.
9.	Al.vpd.d		R1	As explained above.

Note: Legend and land suitability classification is derived from GIS-based Irrigation Block Mapping.

Result of Soil Survey in Nachchaduwa, Thuruwila and Rajangana:

The result of soil survey shows that well drained reddish brown soil occupies 30 to 40% of the entire area in Nachchaduwa and Rajangana major irrigation scheme. Therefore, from a soil texture view point, those schemes have the possibility of promoting crop diversification in fields having such soil characteristics. On the other hand, Thuruwila medium scheme is mainly dominated by alluvial soils which is characterized by being poorly drained with a ground water table, and perched water table action is evident in the profile according to the survey. The area is, therefore, suitable for paddy cultivation (Appendix-E GIS-based Irrigation Block Mapping)



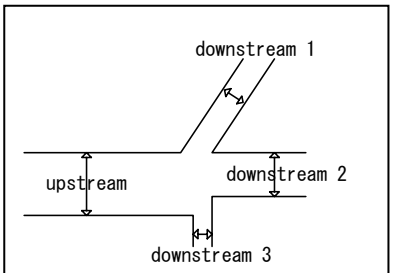
Summary of Soil Survey

Tips

(1) Soil survey results can be effectively utilized if the data are incorporated into GIS-irrigation block mapping. Area calculation and classification can be easily carried out using GIS; therefore, a cropping plan suitable for the natural resource status would be formulated based on soil characteristics.

FURTHER INFORMATION

⇒ Final Report Chapter 3 GIS-based Irrigation Block Mapping
⇒ Annex-E GIS-based Irrigation Block Mapping
⇒ GIS Database prepared under the JICA Study

<table>
<tr><td>IR-02</td><td colspan="2">Inventory Survey</td></tr>
<tr><td>IR-02-01</td><td colspan="2">Function Assessment of D- and F-canal Level Facilities</td></tr>
<tr><td>Purpose</td><td colspan="2">➢ To assess the function of facilities (canals and structures) in order to prepare management plan including calculation of rehabilitation/repair cost and preparation of those working schedule</td></tr>
<tr><td>Working Group</td><td colspan="2">➢ Irrigation Engineer (IE)
➢ Engineering Assistant (EA), Work Supervisor (WS), Water Issue Laborer (WIL)
➢ Member of Farmers' Organization (FO)</td></tr>
<tr><td>Output</td><td colspan="2">➢ Facilities condition
➢ Rehabilitation cost and schedule
➢ Raising awareness and capacity development of both government field staff and farmers</td></tr>
<tr><td>Work Procedure</td><td colspan="2">(1) Checklist: A checklist for the assessment should be prepared by EA in consultation with farmers (assessment points are tabulated below and FORM-1 and FORM-2 for references).
(2) Assessment locations: Locations for the survey are at the (i) beginning point of each canal (BP), the end point of the canal (EP), serious deterioration point (SDP), diversion point of the canal (DP) as illustrated below and all the structures. The survey interval is at least 200 m for each alignment of the canal.
(3) Assessment team members: Team members consist of (i) surveyors (GPS), (ii) EA, (iii) WS and (iv) representative of FOs and FCGs.
(4) Scheduling meeting: A scheduling meeting is held inviting representative of farmers in order to facilitate the field works (See land and FOs assessment).
(5) Data compilation: The collected field data are checked by each survey team and given to EAs for compilation.
 
Diversion point
Place where Canal Condition were assessed</td></tr>
<tr><td>Necessary Materials and Sample Formats</td><td>NECESSARY MATERIALS
➢ Blocking out plan (BOP)
➢ Issue tree
➢ General layout and/or drawings, if available
➢ Assessment checklist</td><td>FORMATS
➢ Form-5 (Canal)
➢ Form-6 (Structures)</td></tr>
</table>

Assessment points (see FORM-1 and FORM-2)

	Item	Specification
Canals	Location	Coordinate of assessment points
	Date	Date of survey
	Name	Name of the chief surveyor and survey members
	Type	Type of canals (concrete lining, earth, random rubble masonry etc.)

	Item	Specification
	Access	Accessibility to the location
	Dimensions	Dimensions of the canal (survey section), (top width, bed width, depth of the canal, water depth in the canal, if any)
	Problems	Sediment, vegetation, erosion, leakage, overflow, illegal tapping, condition of the canal road and any others
	Evaluation	Overall evaluation based on above-mentioned check points (qualitative assessment from A to D)
	Sketch	Sketch and/or photograph
Structures	Location	Coordinate of assessment points
	Date	Date of survey
	Name	Name of the chief surveyor and survey members
	Type	Type of structures (turnout, duckbill weir, diagonal weir, drop, spillway, culvert, farm turnout and others)
	Access	Accessibility to the location
	Problems	Gate, operation corrosion cracks, leakage downstream damage, measuring device and others, if any
	Evaluation	Overall evaluation based on above-mentioned check points (qualitative assessment from A to D)
	Sketch	Sketch and/or photograph

Scheduling Meeting
Preparing assessment schedule by gathering relevant government field staff and representative of FOs so as to facilitate field works

Canal function assessment in the field
carried out by Development Assistants, surveyors and Representative of FCGs

Tips

(1) The checklist will be used by both engineers and farmers; therefore, prepare it in a simple format to smoothly share ideas among all assessment team members. Don't make it too complicated.

(2) Data collected from this assessment can be effectively compiled and analyzed if a user-friendly database is constructed (see IR-03 GIS-based irrigation block mapping)

(3) A joint transect-walk by farmers and government field staff is aimed at not only clarifying the condition of facilities, but also at bridging the gap of perspectives between farmers and engineers on the functioning of facilities by the presence of people with a range of technical skills needed to clarify the reality of the field conditions. Keep the atmosphere informal to get good result.

FURTHER INFORMATION

⇒ Annex-E GIS-based Irrigation Block Mapping
⇒ Land and FOs activities assessment for the arrangement of scheduling meeting
⇒ Getting Started with ArcGIS (ArcView manual published by ESRI)

<table>
<tr><td>IR-02</td><td colspan="2">Inventory Survey</td></tr>
<tr><td>IR-02-02</td><td colspan="2">Land and FOs' Activities Assessment</td></tr>
<tr><td>Purpose</td><td colspan="2">➢ To identify the type of land ownership, land use, membership of FOs, payment of O&M fee, and attendance to Shramadana</td></tr>
<tr><td>Working Group</td><td colspan="2">➢ Institutional Development Officer (IDO)
➢ Engineering Assistant (EA), Work Supervisor (WS) and Water Issue Laborer (WIL)
➢ Member of Farmers' Organization (FO)</td></tr>
<tr><td>Output</td><td colspan="2">➢ Type of land ownership (original owner, tenant, lease and Thattu-Maru)
➢ Current land use (paddy, OFC, banana and others)
➢ FOs' activity (membership of FOs, O&M fee payment, and attendance ratio to Shramadana)</td></tr>
<tr><td>Work Flow</td><td colspan="2">(1) Questionnaire: Questionnaire for the assessment should be prepared by IDO in consultation with other relevant staff such as EA, WS and WIL (sample format is shown in FORM-7 for references).
(2) Assessment team members: Team members consist of (i) IDO, (ii) EA, (iii) WS/WIL and (iv) representatives of FOs and FCGs.
(3) Scheduling meeting: A kick-off and scheduling meeting must be held to invite relevant government staff and representative farmers to arrange the work as well as to share ideas on how to facilitate field works. Sample meeting agenda is shown below.
(4) Data compilation: Data collected in the field are checked by each survey team and given to IDOs for compilation and analysis. As with the facilities assessment, GIS can be applied to this work effectively.
 
Sample of Land and FOs' Activities Assessment : (Rajangana LB Tract 2) depicting F-canal Command Area</td></tr>
<tr><td>Necessary Materials and Sample Formats</td><td>NECESSARY MATERIALS
➢ Blocking out plan (BOP)
➢ Issue tree
➢ General layout and/or drawings, if available</td><td>FORMATS
➢ Form-7 (Land and FOs Activities Assessment)</td></tr>
</table>

Scheduling meeting arrangement

Sample agenda of kick-off and scheduling meeting is shown as follows:

Kick-off and Scheduling Meeting for the GIS-Based Irrigation Block Mapping				
Date and venue:	December 21st 2005 for Nachchaduwa and Thuruwila (Irrigation Auditorium in Anurahhapura) December 22nd 2005 for Rajangana (IE's Office)			
Agenda:	9:30 -9:40	Introduction and outline of the Study	JICA Study Team	(Mr. Otsuka)
	9:40-10:10	GIS Mapping by ID	ID	(Ms. Janaki)

	10:10 – 10:50	Outline of mapping works EML Work procedure Expected outputs Work schedule Cooperation necessary from relevant parties	(Mr. Piyadasa)
	10:50 – 11:10	Coffee Break	
	11:10 – 12:00	Question and answer	
Attendance:	(i) Irrigation Department	Irrigation Engineer (IE) Engineering Assistant (EA) Work Supervisor (WS) Development Assistant (DA)	
	(ii) Irrigation Management Division (IMD)	Resident Project Manager (RPM) Institutional Development Officer (IDO) Development Assistant (DA)	
	(iii) Divisional Secretary (DS)	Grana Niladari (GN)	
	(iv) Department of Agrarian Development (DAD)	Divisional Officer (DO) Agriculture Research and Production Assistant (ARPA)	

Kick-off and Scheduling Meeting
Attended by relevant government staff and FO representatives, and the purpose of the work, schedule, and cooperation necessary from FOs is explained.

Identification of current land and FOs Status through interviewing farmers by DAs
Carried out in consultation with FO members as an important step

Tips

(1) Because the members of FOs are, first and foremost, the best parties to know the ownership and activities of the FO, a scheduling meeting should be carefully arranged so as to positively involve FOs in the working process.

(2) In the JICA Study, the abovementioned information was collected for each plot and input using GIS, thereby making the works quite laborious. Therefore, data for this survey should be collected to meet future requirement.

(3) One alternative method would be that the area is divided by each owner with ID (without detailed plot boundary) so that the assessment can be carried out more simply.

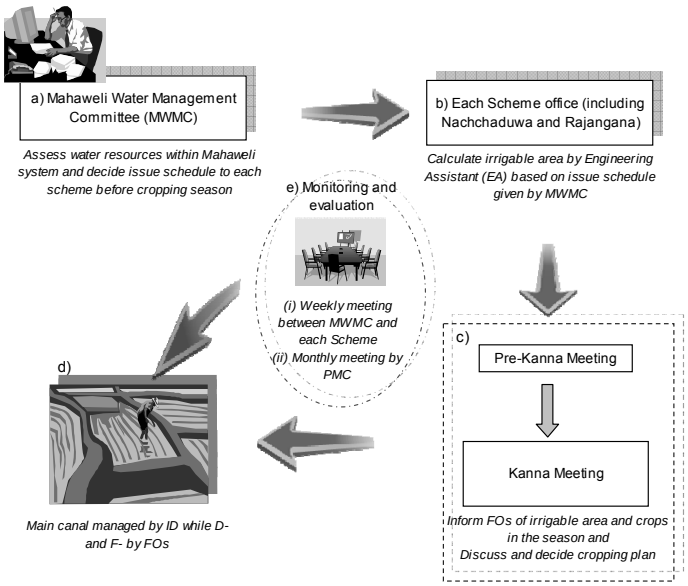
FURTHER INFORMATION

⇒ Annex-E GIS-based Irrigation Block Mapping
⇒ IR-02 Irrigation Facilities' Assessment
⇒ Getting Started with ArcGIS (ArcView manual published by ESRI)

IR-03	Irrigation O&M and Water Management	
IR-03-01	Water Management Decision-Making Process and its performance	
Purpose	➢ To identify the organization's formal and informal mandates for irrigation water management ➢ To interpret what is required as a result of these mandates (leading probably to explicit goals or performance indicators) ➢ To identify the decision-making process to clarify weak points or constraints and/or the areas for improvement is required in irrigation water management	
Working Group	➢ Irrigation Engineer (IE) ➢ Engineering Assistant (EA) ➢ Farmers' Organization ➢ Other organization related with this process	
Output	➢ Water management Decision-Making Process Flow and its function in various stages	
Work Procedure	(1) ***Data Collection***: Necessary data should be collected for this study, such as legal backing related to irrigation (Irrigation Ordinance and Mahaweli Regulation), rotational irrigation schedule, monitoring and evaluation record and minutes of Kanna Meeting and/or Project Management Committee (PMC). (2) ***Identification of mandates of each stakeholders***: Different stakeholders have different mandates for appropriate irrigation water management. Based on the collected data, such responsibilities are identified and a flow chart of the decision-making process is prepared. In this process, it is also important to clarify what is not ruled out by these mandates, meaning that the rough boundaries of the organization's unconstrained field of action are defined. O&M including irrigation water management of the main facilities depend on the government while FOs are responsible for D- and F-canal level facilities. (3) ***Identification of weak points or constraints***: Based on the process flow, weak points or constraints attributed to the capability of certain arrangements and/or ineffective work processes are identifed. Measurement of the performance of irrigation water management would be effective in this process (see the table in the next page).	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** Broader perspectives are required for this study. The following materials are, therefore, essential requirements but not necessarily sufficient, depending on the irrigation scheme. ➢ Legal backing related to irrigation such as Irrigation Ordinance and Mahaweli ➢ Rotational irrigation schedule prepared by each scheme ➢ Monitoring and evaluation record	**FORMATS** ➢ See below as a sample of decision-making process flow

Sample of Water Management Decision-making Process

Some examples of the irrigation water-management decision-making process with a description of the irrigation schemes within the Mahaweli system are shown below:

Description	Flow
a) The MWMC assesses water resources within the Mahaweli system. In seasonal Water Panel Meeting, they decide water distribution schedule. b) Each office roughly calculates the irrigable area in the season. 5 acre feet/acre (Maha) and 7 acre feet/acre (Yala) is generally utilized as the unit water requirement. c) Through the series of "Pre-Kanna" and "Kanna Meeting (a seasonal cultivation meeting)," the cultivation schedule is finalized. d) Water issue among main system is managed by ID while D- and F-system is by FOs. e) Water issue practice is regularly monitored by WIL under the instruction of EA and WS. Meetings are also held (i) among MWMC and each scheme office (weekly), and (ii) Project Management Committee (PMC) meeting (monthly).	 **Water Management Decision-Making Process in Major and Medium Irrigation Scheme**

Irrigation Water Management Performance Measurement

Some guidelines for measuring the performance of water management are tabulated below:

Performance Measurement Indicator and Parameter for Irrigation Water Management

		Indicator	Parameter
1	Water Distribution	Equity	Amount
			Quality
			Percentage of area actually irrigated
			Percentage of farm lots with adequate water
		Reliability	Timeliness
		Opportunity	Quantity
2.	Efficiency & system performance	Water use efficiency	Water productivity (yield per cubic meter of irrigation water)
		Access to water in relation to rights	Indices of irrigation water utilization

Tips

(1) Not only engineering aspects, but also legal backing is important for all the field staff related to irrigation to identify constraints of water management thereby increasing the capacity in integrated management.

FURTHER INFORMATION

⇒ Final Report Chapter 3 Irrigation O&M and Water Management

⇒ Annex-A Irrigation O&M and Water Management (legal backing in Chapter 1 and water management in chapter 3)

⇒ IR-03-02 Operation and Maintenance and its Performance

Some Sample calculations and compilations of the study result derived from the Final Report

Water Duty and Water Productivity in the Study Area

Scheme	Season	Water Issue (MCM)	Area Harvested (ha)	Water Duty (mm)	Production (kg/ha)	Water Productivity (kg/m^3)
Nachchaduwa	Yala	22.8	1,622	1,411	4,566	0.322
	Maha	27.6	2,635	1,116	5,133	0.630
Thuruwila	Yala	4.4	1,92.9	2,325	5,004	0.216
	Maha	3.9	1,92.9	2,075	5,004	0.242
Rajangana	Yala	152.0	5,508	2,681	4,796	0.186
	Maha	126.6	5,658	2,518	5,135	0.282

Note: Periods of Data are not the same.
Production in Thuruwila is assumed.
Source: Prepared by the Study Team

O&M Budget of Irrigation Department

No	Item to Compare	Unit	Nachchaduwa	Thuruwila	Rajangana
1	Operation Budget	Rs. (Rs./ha)	134,200 (46)	9,000 (46)	281,600 (42)
	a ID's Expenses	Rs.	67,100	9,000	84,480
	b FO Expenses	Rs.	67,100	0	197,120
2	Maintenance Budget	Rs. (Rs./ha)	874,600 (301)	58,500 (303)	1,835,900 (277)
	a Headworks	Rs.	174,920	No separate budget for Sub-items	555,700
	b Roads	Rs.	87,460		
	c Main & Branch Canal	Rs.	349,840		535,731
	d Distributory Canal	Rs.	262,380		377,286
	e Field Canal	Rs.	FO's Responsibility	FO's Responsibility	367,180

Source: Prepared by the Study Team

Water Charges and Ration of Collection

No.	Item to Compare	Unit	Nachchaduwa	Thuruwila	Rajangana
1	Acreage Tax paid to ADC	Rs/ha/Annum	15	16	15
		Collection %	100	100	100
2	Membership Fee	Entrance Rs.	100	130 (Life Time)	100
		Collection %	100	100	100
		Annual Rs.	25	0	0
		Collection %	100	-	-
3	O & M Fee for FO Jalapalaka & Maintenance	Rs/ha/Annum	1,500 (1 bushel/ crop/acre)	750 (250/acre/ year)	1,500 (1 bushel /crop/acre)
		Collection %	Very Poor	Poor	17-25

Source: Prepared by the Study Team

IR-03	Irrigation O&M and Water Management	
IR-03-02	Operation and Maintenance and its performance	
Purpose	➢ To identify the organization's formal and informal mandates for irrigation O&M ➢ To interpret what is required as a result of these mandates (leading probably to explicit goals or performance indicators) ➢ Identification of the decision-making process to clarify weak points or constraints and/or the areas of improvement required in irrigation O&M	
Working Group	➢ Irrigation Engineer (IE) ➢ Engineering Assistant (EA) ➢ Farmers' Organization (FO) ➢ Other organization related with this process	
Output	➢ Irrigation O&M Responsibility and its function at various stages ➢ Identification of above-related problems and constraints	
Work Procedure	(1) ***Data Collection***: Necessary data should be collected for this study such as legal backing related to irrigation (Irrigation Ordinance and Mahaweli Regulation), rotational irrigation schedule, O&M monitoring and evaluation record and minutes of Kanna Meeting and/or Project Management Committee (PMC). (2) ***Identification of mandates of each stakeholders***: Different stakeholders have different mandates for carrying out appropriate irrigation O&M. Based on the collected data, such responsibilities are identified and decision-making process flow is prepared. In this process, it is also important to clarify what is not ruled out by these mandates, meaning that the rough boundaries of the organization's unconstrained field of action are defined. O&M including irrigation water management of the main facilities depend on the government while FOs are responsible for D- and F-canal level facilities . (3) ***Identification of weak points or constraints***: Based on the responsibility matrix, weak points or constraints attributed to the capability of certain arrangements and/or ineffective O&M work processes are identified. Measurement of the performance of irrigation O&M would be effective in this process (see the table: **Performance Measurement Indicator and Parameter for Irrigation O&M** in the next page).	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** Irrigation O&M is an interdisciplinary issue. The following materials are, therefore, essential requirements but not necessarily sufficient, depending on irrigation schemes. ➢ Legal backing related with irrigation such as Irrigation Ordinance and Mahaweli ➢ Irrigation O&M monitoring and evaluation record	**FORMATS** ➢ See below as a sample of responsibility matrix

Sample of Water Management Decision-making Process in Irrigation O&M

Some examples of the irrigation O&M responsibility for major and medium irrigation schemes are tabulated below:

Responsibilities of O&M

Work item	Major scheme (Nachchaduwa and Rajangana)	Medium scheme (Thuruwila)
Decision-making for O&M	Farmers meeting, PMC, Kanna Meeting	Farmers meeting, PMC, Kanna Meeting
Gate Operation		
- Tank Sluice	ID (Jalapalaka)	FO assisted by ID (Jalapalaka)
- Main and branch canals	ID (Japapalaka)	FO (Japapalaka)
- D-canals head gate	ID (Japapalaka)	FO (Japapalaka)
- F-canals head gate	FO (FO Water master/Jalapalaka)	FO (Jalapalaka)
Maintenance		
- Tank	ID	ID
- Main and branch canals	ID	ID
- D-canals	FO	FO
- F-canalas	FO	FO

Source: Draft Final Report

Irrigation O&M Performance Measurement

Based on the responsibility identified, level of irrigation O&M is assessed based on the indicators and parameters. Here, such indicators are categorized into seven: (i) participation, (ii) maintenance, and (iii) sustainability of the system, as summarized as follows:

Performance Measurement Indicator and Parameter for Irrigation O&M

No.	Indicator		Parameter
1	Participation	In planning, design, and decision-making In irrigation O&M	% of farmers attending meeting (PMC and Kannna Meeting)
			Presentation of farmers during the meeting
		Maintenance work	Willingness to pay in O&M fee, salaries and other charges
			Collection efficiency
			% of participation in Shramadana for O&M
2.	Maintenance		% of canals properly maintained
			% of days in which system is interrupted (due to repairs etc.)
			O&M costs per hectare
3	Sustainability of system	Payment capability	Capacity to pay for O&M by FOs
		Investment cost	Technology cost in relation to the incremental benefit

Tips

(1) Not only engineering aspect, but also legal backing is important for all the field staff related to irrigation to identify constraints of water management thereby increasing the capacity for integrated management.

(2) Quantitative parameters are proposed above; however, insufficient data would often make it difficult to carry out such quantitative analysis. Qualitative analysis based on field reconnaissance and interview is also acceptable and effective in this subject of study.

FURTHER INFORMATION

⇒ Final Report Chapter 3 Irrigation O&M and Water Management

⇒ Annex-A Irrigation O&M and Water Management (legal backing in Chapter 1 and water management in chapter 3)

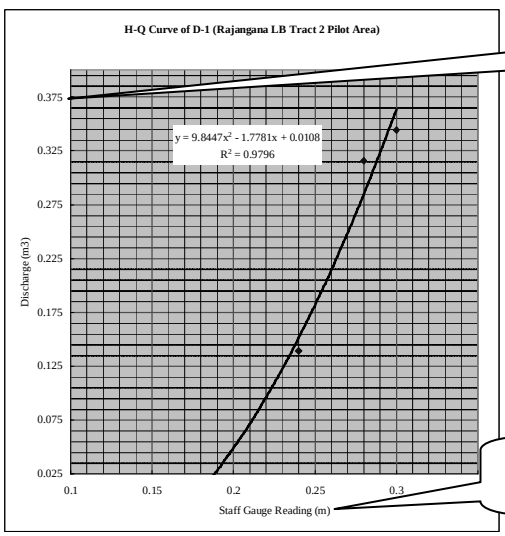
⇒ IR-02-01 Function Assessment of D- and F-canal Level facilities

⇒ IR-03-01 Water Management Decision-Making Process and its Performance

<table>
<tr><td>IR-03</td><td colspan="2">Irrigation Water Management</td></tr>
<tr><td>IR-03-03</td><td colspan="2">Discharge Measurement at the Head of D-canal</td></tr>
<tr><td>Purpose</td><td colspan="2">➢ To prepare a H-Q curve (or rating curve)
➢ For the measurement and recording of daily discharge at the head of D-canals</td></tr>
<tr><td>Working Group</td><td colspan="2">➢ Engineering Assistant (EA), Work Supervisor (WS) and Water Issue Laborer (WIL)
➢ FO Water Master (member of Farmers' Organization (FO))
➢ Institutional Development Officer (IDO)</td></tr>
<tr><td>Output</td><td colspan="2">➢ H-Q Curve
➢ Daily discharge record at the head of D-canal</td></tr>
<tr><td>Work Procedure</td><td colspan="2">(1) Measurement point: The measurement point should be at the beginning of D-canals taking the following points into consideration: (i) points should be located near a staff gauge, (ii) water flow is stable and not stagnant, (iii) the flow at the section is uniform, not divided, and (iv) there is no inflow or outflow between the gauge and the measurement point.
(2) Equipment: A current meter for measuring small discharge would is preferred for preparing D-canal level H-Q curve.
(3) Field measurement: (i) Determine measurement depth by checking water depth (D) at the measurement section. If D>0.5m, then measure two points: 0.2 D and 0.8 D from the surface. If D<0.5m, then measure one point: 0.6 D from the surface. (ii) Check depth indicated at the staff gauge and start water velocity by current meter. (iii) Fill up measurement result using FORM-4. (iv) At the same time, water flow area is measured and calculated. (iv) Discharge can be obtained by multiplying velocity by the area of the wetted perimeter. (v) Plot the result on the plotting sheet, then change the discharge by operating the turnout gate on the main canal and repeat the procedure. (v) Obtain points for several discharges and draw the H-Q Curve (see sample H-Q curve as follows).
 
Reading Staff Gauge by ID Jalapalaka (Rajangana)
(4) Daily discharge record: Daily discharge recording form (date, time, and depth H) is shown in FORM-6 to be filled by WIL based on water distribution schedule.</td></tr>
<tr><td>Necessary Materials and Sample Formats</td><td>NECESSARY MATERIALS
➢ Current meter
➢ Staff gauge (to be newly installed by ID, if it is not available)
➢ Stop watch
➢ Measuring tape</td><td>FORMATS
➢ FORM-8 Discharge measurement and calculation
➢ FORM-9 Plotting Sheet for H-Q Curve Preparation
➢ FORM-10 Daily Discharge to D-canal (Pilot Area)
➢ FORM-11 Daily Discharge to D-canal (Control Area)</td></tr>
</table>

Sample of H-Q Curve

H-Q Curve for D-1 (pilot area), LB tract 2 in Rajangana Major Irrigation Scheme, prepared based on field measurement is illustrated as follows:



Example: H-Q Curve of D-1 in LB Tract 2 Rajangana

Discharge = $9.8447x^2 - 1.7781x + 0.0108$

$R^2 = 0.9796$ (regression coefficient)

If H = 0.30 m, then discharge (Q) is,

$Q = 9.8447 \times 0.30^2 - 1.7781 \times 0.30 + 0.0108$

$= 0.363\ m^3/sec$

H-Q Curve of D-1, pilot area in Rajangana

Staff gauge at the head of D-canal at LB Tract 2 in control area (Rajangana)

Most of the D-canals have such a staff gauge at the head of the canal, therefore, preparation of H-Q curve is helpful to easily convert water depth into discharge

Operation of current meter by Development Assistant (Rajangana)

Measuring water velocity at the head of D-2 in control area in LB tract 2, section is a concrete rectangle, therefore, suitable for measurement

Tips

(1) Each current meter has a unique calibration, thereby requiring a different equation to obtain velocity such as "velocity = 0.086 N + 0.019, say N = (dial number) x (number of buzzer) / (time)." One must check the manual prior to using the equipment.

(2) In order to maintain the accuracy of the current meter, periodical calibration, say once a year, is required.

(3) Some of the D-canals have a measuring device (concrete weir). Discharge measurement can be carried out using such devices.

FURTHER INFORMATION

⇒ Current meter manual (Sanei-3, No. 6137)

⇒ IR-03-02 Discharge Measurement at the Head of F-canal

IR-03	Irrigation Water Management	
IR-03-04	Discharge Measurement at the Head of F-canal	
Purpose	➢ To raise the awareness of FO members about the importance of irrigation water ➢ To establish M&E mechanism by the government staff within the command area of D-canals ➢ To clarify whether irrigation water is delivered in accordance with the schedule	
Working Group	➢ FO Water Master (member of Farmers' Organization (FO)) ➢ Engineering Assistant (EA), Work Supervisor (WS) and Water Issue Laborer (WIL) ➢ Institutional Development Officer (IDO)	
Output	➢ Discharge record at the head of F-canal ➢ Optimization of water allocation among D-canal command area ➢ FOs' awareness on the importance of water management	
Work Procedure	(1) ***Measurement point selection***: Discharge measurement should be carried out at the beginning point (BP) of F-canals. (2) ***Equipment***: Measurement methodology differs among F-canals because some of them have a concrete weir while others do not. Measuring devices such as a parshall flume or cut-throat flume can be provided by the Irrigation Training Institute (ITI) Galgamuwa and installed if the existing concrete weir has deteriorated (see explanation of parshall flume in the table below and some theoretical background is given in the tips.). (3) ***Field measurement***: (i) Install measuring devices at the head of the F-canal so there is no leakage from the bottom and/or side of the device. (ii) Wait until flow stabilizes and then read the water level (discharge). (iii) Enter the results using FORM-8 or FORM-9. (iii) Compare the results against the irrigation schedule. (4) ***Awareness and M&E as an important purpose***: It should be emphasized that discharge at the head of the F-canal is not necessarily measured daily. Instead, it should be measured during important cropping phases such as land preparation and ordinary cropping period. Awareness raising and M&E mechanism by the government are, first and foremost, important reasons for this practice.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Spray paint (black and yellow) ➢ Template (for staff gauge painting) ➢ Measuring device such as parshall flumes, cut-throat flume etc. (provided by the ITI)	**FORMATS** ➢ FORM-12 Daily Discharge to F-canal (Pilot Area) ➢ FORM-13 Daily Discharge to F-canal (Control Area)

Weirs

Weirs are a type of measuring device with sharp-crested, overflow structures that are built across open channels such as canals. They are easy to construct and can measure the discharge accurately when correctly installed. However, it is important to note that the water level downstream must always be below the weir crest to ensure complete overflow, otherwise the discharge reading will be incorrect. In

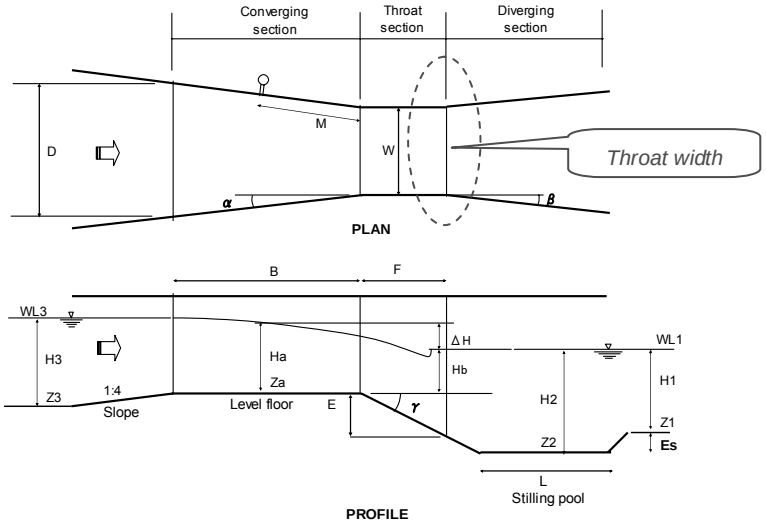
addition, an appropriate method should be applied depending upon the amount of discharge. The following table can be a guideline to select the correct method for discharge measurement.

Type of Weir

Type of weir	Width of weir or (width of weir) x (width of notch) (m)	Range of head H (m)	Range of discharge Q (l/sec)
Triangular (v-notch weir) (90 degrees)	0.60	0.070 – 0.200	1.83 - 25.0
	0.80	0.070 – 0.260	1.83 - 48.5
Rectangular weir	0.90 x 0.36	0.030 – 0.270	3.5 – 91.7
	1.20 x 0.48	0.030 – 0.321	4.7 – 150.0
Parshall flume	76.2 (mm) (=W)	-	8.3 - 53.6
	152.4 (mm) (=W)	-	13.9 – 110.6

Note: Parshall flume is a pre-fabricated measuring device as the type is determined by the width of the throat (see illustration below). Discharge can be measured by easily reading scale pre-painted on the devices.

Source: Land Improvement Plan Design Criteria in Japan (Ministry of Agriculture Forestry and Fisheries, Japan)
Hydraulic Test, Irrigation and Drainage Course, Tsukuba International Agricultural Training Centre, JICA



Schematic illustration of parshall flume

The geometry of parshall flume must meet specific criteria as indicated in the plan and profile.

Temporal wooden board weir

Discharge measurement can be carried out also using temporary means so as to approximately assess water management practice among D-canal command area.

Tips

(1) In the ITI, Galgamuwa, a pashall flume with a throat width of 76.2 mm is available which would be generally suitable for the measurement of F-canal discharge.

(2) Parshall flumes are operated under what are called free-flow or sub-merged conditions. Under free-flow conditions, the tailwater level does not affect flow through the convergent crest section. The flow passes through critical depth at the crest and only one depth measurement at point Ha in the illustration is required to evaluate the discharge.

FURTHER INFORMATION

⇒ IR-03-01 Discharge Measurement at the Head of D-canals

Tips

Long-crested Weir

Duckbill Weir(Pilot Area, LB Tract 2)

The pilot area of Rajangana LB tract 2 adopted a duckbill weir and diagonal weir. In general, the concept of a long-crested weir is to ensure longer length of weir than is possible with typical weirs installed across the canal with the crest perpendicular to the centerline of the canal. Such additional length enables design flow discharge to pass with smaller variable of heads, meaning that even large changes in discharges over the crested weir will result in smaller changes in head, thereby changing smaller inflow into F-canals. In general, constant flow rates are comparatively user-friendly requiring less workforce for irrigation water management; therefore, long-crested weirs can help reduce the difficulty of water management. In addition, if adopting conventional system, upstream area are often provided with excessive water due to difficulty in managing large variation of head as well as misuse of turnout, however, the system of long-crested weir can be helpful for water to be allocated among command areas equally in accordance with water management schedule.

Baffle Distributor

Baffle Distributor (Pilot Area, LB Tract 2)

A baffle distributor controls discharge by opening a specified number and combination of different widths of baffle gate so that the required discharge is released through the opening of the gate. This system is not related to the downstream discharge conditions to maintain the flow nearly constant. They are easily understood by gate operators as well as water users, if appropriately introduced. The flow rate is easily known by observing how many gates are open. Therefore, from a technical point of view, the combination of a long-crested weir with a baffle distributor enhances the ability to divert a constant discharge from D-canal to F-canal as scheduled.

Discharge measurement using a baffle distributor differs from other systems such as a weir (see below). To do this, the gate opening is first checked and the water level is judged by checking the level at the horizontal bar attached on the baffle gate see right. The gate has been already calibrated prior to the setting. Therefore, when the water level is almost the same as that of the bar, the discharge is as specified in the table (see right).

Horizontal Bar attached with Baffle Distributor (Pilot Area, LB Tract 2)

Baffle Arrangement

Canal	Baffle Arrangement (lit/sec)
FC-7	15 / 10 / 5
FC-8	15 / 10 / 5
FC-9	30 / 15 / 10 / 5
FC-10	15 / 10 / 5
FC-12A	15 / 10 / 5
FC-12	15 / 10 / 5
FC-13	15 / 10 / 5
FC-13A	15 / 10 / 5
FC-14	15 / 10 / 5

Discharge Measurement by the use of Weirs

In the control area in LB Tract 2, Rajangana Major Scheme adopts a weir for discharge measurement at the head of F-canals (see picutre at right). Discharge is calculated by measuring overflow depth above the weir crest. The equation is shown below:

$$Q = CBH^{\frac{3}{2}}$$

Q: Discharge (m^3/sec), C: Coefficient, B: Width of weir (m), H: Overflow depth (m)

$$C = 1.785 + (\frac{0.00295}{H} + 0.237\frac{H}{Hd})(1+\varepsilon)$$

where Hd: Notch height from the bottom (m) ε : Correction term

$Hd \le 1m \quad \varepsilon = 0 \quad Hd \ge 1m \quad \varepsilon = 0.55$

The applicable range of this formula is as follows: $B \ge 0.5m$, Hd =0.3 – 2.5 m,

H = 0.03 – Hd (provided that $H \le 0.8m$), $H \le \frac{B}{4}$

Measuring Device at the Head of F-canal (Control Area, LB Tract 2)

One of the key features in correct estimation of discharge using weirs is that the measurement of head above the weir crest be carried out in accordance with standardized procedures. One of the criteria required is that the flow velocity in the approach section be less than or equal to approximately 0.15 m/sec. This can normaly be maintained by establishing a pool of water behind the weir which extends upstream for a distance of 3 to 7 times the head on the weir crest.

IR-04	Data Management Support Tool	
IR-04-01	GIS-based Irrigation Block Mapping	
Purpose	➢ To establish a database to provide an effective methodology for irrigation development and management	
Working Group	➢ Irrigation Department (ID)/Irrigation Management Division (IMD) Head Office ➢ Irrigation Engineer (IE) ➢ Engineering Assistant (EA) ➢ Farmers' Organization (FO)	
Output	➢ GIS and Access database for target irrigation schemes	
Work Procedure	General work procedure for the preparation of GIS-based irrigation block mapping is illustrated in Figure I.1. The work primarily consists of three steps explained as follows: (1) ***Step-1 Data collection, processing and digitization***: The data necessary for mapping actually differs depending upon its purpose. The satellite imagery used for the JICA Study was IKONOS having maximum resolution of 1m (see specifications on the next page). Aerial photography available from the Survey Department in Colombo was also utilized. Such data are imported into GIS and digitized for the preparation of preliminary base maps. (2) ***Step-2 Field confirmation***: Some data such as F-canals and small canal structures cannot be identified just by processing satellite imagery and/or aerial photographs. Therefore, field confirmation is carried out using preliminary base maps to collect supplementary data in the field thereby finalizing the base map. (3) ***Step-3 Detailed field survey***: Assessment of function of facilities, land and FOs activities survey is carried out using base maps (see IR-02-01 and IR-02-02 for details). (4) ***Output***: Collected data is input and/or updated using Access database and GIS.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Satellite imagery ➢ Aerial photograph ➢ General layout ➢ Blocking out plan (BOP) ➢ Issue tree	**FORMATS** ➢ See IR-02-01 Function Assessment of D- and F-canal Level Facilities, IR-02-02 Land and FOs' Activities Assessment and Annex-E GIS-based Irrigation Block Mapping

What's the Input Required for the Preparation of GIS-based Irrigation Block Mapping?

Although the effectiveness of GIS in the application of irrigation development and management is recognized, one should be aware the input necessary for its preparation. Developing a database from

Man-power required for the Survey

Work item	Work Capability (ha/day/team)	Man-power Required/team
Data Digitization, Input and GIS Operation		
Aerial photograph processing	200	1 GIS expert
Digitization		
Outer boundary	500	1 GIS expert
Canal alignment and facilities location	30	1 GIS expert
F-canal command area	50	1 GIS expert
Facilities Condition	100	1 GIS expert

scratch could cost a considerable amount. The following table summarizes the man-power required for the work from base map preparation, field data collection and data input.

Field Survey		
Outer Boundary Confirmation	500	1 surveyor, 3 SAs, 1 LG
Canal Alignment and Facilities Location Confirmation	20	1 surveyor, 3 SAs, 1 LG
F-canal Command Area Confirmation	30	1 surveyor, 3 SAs, 1 LG
Facilities Survey	15	1 surveyor, 3 SAs, 1 LG

Remarks: 1. Survey Assistant (SA), Local Guide (LG)
2. Man-power necessary for query building and manual preparation cannot be easily estimated since work quantity is extremely different depending upon the purpose of database.

Data Necessary for the Preparation of Base Map

Most of the scheme does not have an adequate general layout, so preparation of base maps requires reliable base information. Deciding what is reliable information for the base map can help finalize the scope and future application of the GIS database.

If the database is utilized especially for irrigation asset management and water management, aerial photographs available from the survey department in Colombo would basically be sufficient rather than purchasing highly costly but accurate satellite imagery.

General Specification of IKONOS

Orbit		
Type	Sun-Synchronous	
Altitude	681 km	
Inclination	98.1 deg	
Descending node crossing time	10:30 am local solar time	
Period	98 min	
Off-Nadir Revisit	1.5 to 2.9 days at 40 degrees latitude	
Sensor Characteristics		
Viewing Angle	Agile spacecraft, along track and across track pointing	
Swath Width	11 km nominal at nadir	
Image Modes	Single scene: 13km x 13 km Strips: 11 km x 100 km up to 11 km x 1,000 km	
Metric Accuracy	12 m horizontal, 10 m vertical without GCP	
Radiometric Digitization	11 bits	
Spectral Bands	Wavelength (μm)	Resolution
1 (blue)	0.40 – 0.52	4 m
2 (green)	0.52 – 0.60	4 m
3 (red)	0.63 – 0.69	4 m
4 (NIR)	0.76 – 0.90	4 m
Panchromatic	0.45 – 0.90	1 m

Source: Centre for Remote Imaging, Sensing & Processing

Tips

(1) The scope of mapping works, particularly GIS layers, should be clearly determined prior to commencement, since the work volume and cost differ significantly depending upon the information to be compiled.

(2) In this regard, introduction of GIS as well as preparation of a complete database is not easy or straightforward and cannot be simply classified as a technical exercise involving calculated choices of appropriate techniques. The database should, therefore, be developed to satisfy the minimum requirements at the initial stage and accordingly scaled-up when necessary.

FURTHER INFORMATION

⇒ Final Report Chapter 3 GIS-based Irrigation Block Mapping
⇒ Annex-E GIS-based Irrigation Block Mapping
⇒ IR-02-0? Function Assessment of D- and F-canal Level Facilities
⇒ IR-03-0? Land and FOs' Activities Assessment
⇒ Getting Started with ArcGIS (ArcView manual published by ESRI)

Chapter 4

AG-01	Socio-Economic Assessment
AG-01-01	Socio-economic Survey
Purpose	➢ To grasp the present situation with regard to the socio-economic condition of the farmers in the scheme and to serve as a baseline study guide for impact evaluation.
Working Group	➢ Assistant Director Agriculture ➢ Segment AO ➢ Irrigation Engineer ➢ Resident Project Manager (IMD) ➢ Agricultural Instructor (AI) ➢ Development Assistant (DA) ➢ Grama Niladhari ➢ ARPAs ➢ Farmers
Output	➢ Survey Report presenting the findings on the present socio-economic status of the study population.
Work Procedure	(1) ***General:*** Sample survey is a technique where a convenient random sample is studied to make inferences regarding the whole population from which the sample is drawn. It requires a person who is trained and has social intelligence, manipulative skills and research insight. A suitable person from the working group should be appointed for the purpose (2) ***Collection of secondary data:*** Secondary data relevant to socio-economic conditions in and around the study area should be collected from internal and external sources and reviewed for possible application in the study. (3) ***Selecting a random sample:*** Defining the population, identifying the sample frame, specifying the sample unit, determining the sample size are the basic steps that should be followed to select the survey sample. (4) ***Sampling Method:*** Simple random sampling method can be applied to a listing of the elements in the population using The table of random numbers to select the required number of sample elements. (5) ***Method of data collection:*** Interview method using a structured interview schedule or questionnaire is recommended for data collection. (6) ***Framing questions for the questionnaire:*** The framing of the questions should be done carefully. They should be related to the study objectives, simple, unbiased, easy to understand and each question should address one idea only. The questions should be short and arranged in a logical sequence and organized to facilitate collection and analysis of the data. Inclusion of some control questions would serve as a cross-check to confirm accuracy of the information. (7) ***Form and layout of the questions:*** The questionnaire may have a combination of multiple-choice, dichotomous, and open ended questions. The questions should be grouped under different sub-heads and arranged in a logical sequence with sufficient spaces to do preliminary computations.

	(8) ***Pre-testing and finalizing the questionnaire:*** The draft questionnaire should be pre-tested with 2–3% respondents, who would not be included in the selected sample, to see if it is capable of eliciting the appropriate responses from the respondents. After making appropriate adjustments, the required number of copies should be made in clear print. (9) ***Training of the enumerators:*** The enumerators for the administration of the questionnaire must be carefully selected and trained, particularly if they lack previous experience, and thoroughly briefed. (10) ***Administering the questionnaire:*** It involves face-to-face interaction and the administration of the questionnaire requires skill. The enumerator should state the organization he/she represents and the purpose of the interview to key persons and respondents before starting with the questionnaire. (11) ***Checking the questionnaire:*** At the conclusion of each days work, the questionnaires should be checked and comments and remarks made. (12) ***Processing and analysis of data:*** The data collected requires some processing. These include editing, coding and computer processing. The processed data can then be analyzed by statistical methods to draw inferences on the socio-economic situation of the population. In its simplest form, the data can be presented as measures of central values or location and frequency distributions. The conclusions drawn from the results of the survey supported by the tabulated data should be presented.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Listings of the families in the study area ➢ Table of Random Numbers ➢ Printed questionnaire forms ➢ Stationery	**FORMATS** ➢ FORM-14 ➢ See in the next page

Tips

Key areas to be covered under the sample survey that would lead to making conclusions on the socio-economic situation of the study population may include the following:

General family information, land holdings, farm or operational holdings, housing, home-garden, sanitation, transport, communication, farm equipment & machinery, household income & expenditure, production loans, marketing, community organizations, etc.

FURTHER INFORMATION

⇒ Final Report Chapter 4 Agriculture

⇒ Annex-C

AG-01 SOCIO ECONOMIC ASSESSMENT
AG-01-01 Socio-economic Survey

Sample 1

Distribution of Irrigated Paddy Lands by Size

(Unit: %)

Size of Holding (ha)	N'duwa	Th'wila	R'gana	Mean
0.4 or less	36	57.9	28.1	42.1
>0.4 – 0.8	20	18.4	50	29.5
>0.8 – 1.2	36	7.9	15.6	17.9
>1.2 – 1.6	4	7.9	6.3	6.3
>1.6 – 2.0	0	0	0	0
>2.0	4	7.9	0	4.2

Source: Socio Economic Survey – JICA Study Team- 2005

Sample 2

Annual Household Income

(Unit: Rs.)

Item	N'duwa	Th'wila	R'gana	Mean
Agriculture	123331	92065	73690	96662
Livestock	554	1454	157	722
Labour Wages	11507	9289	14424	11740
Trading	14523	2662	3451	6879
Hire of Machinery	2153	1325	6303	3260
Samurdhi	671	1871	2040	1527
Others	25428	17075	23075	21859
Total	178167	126641	123140	142649
% Agriculture	69.22	73.41	59.84	67.76
% Other Sources	30.78	26.59	40.16	32.24

Source: Socio Economic Survey – JICA Study Team- 2005

Sample 3

Distribution of Total Annual Income

(Unit:%)

Annual Income (Rs)	N'duwa	Th'wila	R'gana	Mean
25,000 and less	0	5.3	12.1	6.2
>25,000 – 50,000	23.1	7.9	15.2	14.4
>50,000 – 75,000	11.5	31.6	21.2	22.7
>75,000 – 100,000	23.1	15.8	3	13.4
>100,000 – 125,000	11.5	7.9	12.1	10.3
>125,000 – 150,000	7.7	2.6	15.2	8.2
>150,000 – 175,000	3.8	7.9	9.1	7.2
>175,000 – 200,000	0	5.3	3	3.1
>200,000	19.2	15.8	9.1	14.1

Source: Socio Economic Survey – JICA Study Team- 2005

AG-02	Agricultural Assessment
AG-02-01	Agricultural Survey by Participatory Method
Purpose	➢ To grasp the present situation of agricultural condition of the farmers with regard to crop production practices & costs and the service sector which would reveal the level of technology applied, cultivation schedule and constraints to serve as a baseline study guide for later impact evaluation.
Working Group	➢ Assistant Director Agriculture ➢ Segment AO ➢ Irrigation Engineer ➢ Resident Project Manager (IMD) ➢ Agricultural Instructor (AI) ➢ Development Assistants
Output	➢ Survey Report presenting the findings on the present agricultural status of the study population.
Work Procedure	(1) ***General:*** Participatory method is a way of learning from, and with community members to investigate, analyze, and evaluate constraints and opportunities and to make informed and timely decisions regarding development projects. It requires a person who is trained and has social intelligence, manipulative skills and research insight. A suitable person from the working group, comprising of a multi-disciplinary team of about 4 - 5 members, should be appointed for the purpose (2) ***Collection of secondary data:*** Secondary data relevant to agricultural conditions in and around the study area should be collected from internal and external sources and reviewed for better understanding and possible application in the study. (3) ***Selecting the group:*** Since specific topics are discussed in detail, a small group of people between 9 and 12 may be invited to participate. The group should comprise officials of the FO, FCG members as well as interested or knowledgeable persons in the community. (4) ***Method of data collection:*** Comprehensive recording is essential and one team member may be assigned for this purpose. Techniques such as ranking could be incorporated to prioritize farmer preferences on some items such as paddy variety, if sufficient time is available (5) ***Framing questions:*** Semi-structured interview schedules with only some of the questions predetermined are used to collect data and information on relevant study topics. Questions can be formulated during the interview and the interview schedule is used as a checklist and a flexible guide for the survey team. (6) ***Administering the questionnaire:*** Questions are asked from the group and the responses are recorded. The team leader should explain the organization it represents and the purpose of the exercise to the participants as well as to key persons in the community. Appointing a facilitator to ensure that the discussion does not diverge too far from the topic and no participant dominates the

	discussion is highly beneficial. (7) ***Processing and analysis of data:*** The data collected requires some processing. These include editing, coding and computer processing. The processed data can then be analyzed and may be presented in descriptive form.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Stationery	**FORMATS** ➢ FORM-15 (Sample form to use as a guideline)

The sample questionnaire attached presents areas where information is required in a highly condensed form and should be used only as a guide and not for direct administration to the farmer participants. It would be useful if the desired topics on which information is sought are presented on news print in simplified form so that the group can better comprehend the point discussed and can provide answers by consensus after brief discussion.

Tips

Key areas to be covered under participatory interview survey that would lead to make conclusions on the agricultural practices in the study population may include the following:

Crop specific practices with regard to variety selection, seed and treatment, land preparation, planting, after-care including fertilizing, pest & disease control and weed management, irrigation, harvesting and post harvest practices. It should also cover supply sources, costs and problems in procuring of inputs (material, machinery and labour), effectiveness of extension and any other information as required.

FURTHER INFORMATION

⇒ Final Report Chapter 4 Agriculture
⇒ Annex-C Agriculture

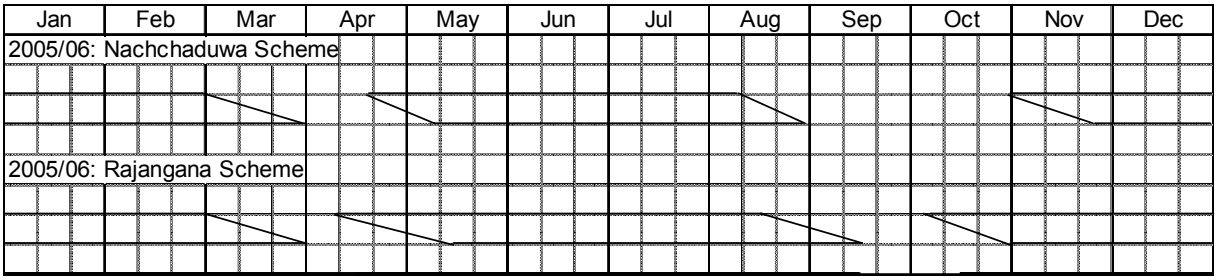
AG-02	Agricultural Assessment	
AG-02-02	➢ Cropping Pattern	
Purpose	➢ To grasp the present situation with regard to the times of crop establishment, crop durations and harvesting to assess whether farmers adhere to the agreed cropping calendar as decided at the 'kanna' meetings.	
Working Group	➢ Assistant Director Agriculture ➢ IE/ Irrigation Department ➢ Agricultural Officer/Agricultural Instructor ➢ Resident Project Manager (RPM) of Irrigation Management Division (IMD) ➢ Irrigation Assistant ➢ IDO ➢ DO/ASC	
Output	➢ Prevailing cropping pattern of the study area.	
Work Procedure	(1) ***Collection of secondary data:*** Secondary data relevant to socio-economic conditions in and around the study area should be collected from internal and external sources and reviewed. These include the minutes of the previous 'Kanna' meetings, minutes of the Project Management Committee meetings, Records on water issues maintained by the IE/IA, and any other source where relevant information is available. (2) ***Collection of primary data:*** Collection of primary data is mainly to confirm the validity of the secondary data. This information can be obtained from the agricultural survey by participatory method discussed under AG 02: AG 02 01. ***(3) Data Presentation:*** The data collected may be compiled and presented in the form of a figure showing the time durations for land preparation and planting, crop duration and harvesting.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Minutes and records of previous meetings and office records ➢ Secondary data from agricultural surveys	**FORMATS** ➢ See in the next page

Tips

As an alternative to the method for collection of primary data by focus group discussion, briefly described under Agricultural assessment AG-02-01, key informant interview type may be adopted. Here, a few knowledgeable farmers such as FO officials and OFC/vegetable growers may be interviewed to gather information on the cropping calendar actually followed during the season.

The usefulness of cropping pattern diagrams can be greatly increased if they are prepared at FO or field canal level. Deviations from the agreed pattern will indicate if farmers in the particular area are faced with problems.

FURTHER INFORMATION
⇒ Final Report Chapter 3 Agriculture
⇒ Annex-C Agriculture



AG-02	Agricultural Assessment
AG-02-03	Crop Budgets
Purpose	➢ To assess the unit income from production of agricultural crops as well as the costs of production in order that the investment costs and profits can be determined for further economic analysis and decision making for and by farmers, FOs, FCGS as well as the officials. The exercise can be carried out for crops under present field practices (without the project condition) and the proposed crop budget after implementation of development activities (with project condition)
Working Group	➢ Segment AO/SMO ➢ Resident Project Manager (IMD) ➢ Agricultural Instructor (AI) ➢ Development Assistant (DA) ➢ Farmer Organizations ➢ Farmers
Output	➢ Crop budgets for paddy and other crops showing a break-down of the costs of production and revenues.
Work Procedure	(1) ***Collection of data:*** For preparation of crop budgets, information with regard to costs of all inputs should be collected from seed and agrochemicals dealers, traders, and from government sources such as the DOA for seed paddy and seeds & planting materials and the ASCs of the Department of Agrarian Development for fertilizers, seeds and agrochemicals. Further, the prevailing machinery hire rates for operations such as land preparation, spraying, threshing, etc. should be collected from machinery and equipment owners serving the area. In addition to the above, the farm gate prices of agricultural products also should be collected from the traders. Information on long term trends in the prices and price behaviour of agricultural products can be collected from a variety of institutions such as KARTI, Central Bank, Department of Census and Statistics, etc., from their regular bulletins and other publications to understand price determination of agricultural products. For preparation of the proposed crop budgets, data on crop yield must be collected in order to estimate the potential crop yields with project condition. Such data could be obtained from previous demonstrations conducted in the area, research institutions, Department of Census and Statistics, DOA, and other sources. The potential unit yields should be matched with recommended crop practices and input utilization as well as the availability of farm labour. A consensus among responsible research, extension and statistical organizations is required in determination of the potential unit yields. (2) ***Collection of field data:*** Primary data on crop specific production costs, unit yield and product prices are required for preparation of crop budgets. The level of inputs, particularly seeds, agro-chemicals and fertilizers, depends on the production practices followed. The information may be collected from the participatory survey of agricultural conditions which is briefly described in

	AG-02-01. If this information is not available, the required data may be collected by conducting a participatory survey by individual or key informant interview method. Prices and rates of application of all inputs including seeds/planting materials, agrochemicals and fertilizers, hiring rates of farm machinery and equipment including tractors, sprayers, threshers, etc., operation wise labour unit requirement, e.g., for land preparation, seeding, pest, disease and weed control, irrigation, reaping, threshing, etc. need to be collected. (3) ***Anticipated results:*** Proposed crop budgets will take into account the improvement in the unit yield as well as the additional costs by way of inputs required to attain the anticipated yield levels. This will show if there is a net gain to the farmer by adopting the recommended package of cropping practices. (4) ***Presentation of data:*** The data collected requires some processing. The crop-wise processed data may be presented under gross revenue, cost of production in terms of materials, machinery and labour, and the net revenue.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Secondary data and information	**FORMATS** See in the next page. ➢ Sample crop budgets for paddy ➢ Tables on crop yield from different sources for yield determination

Tips

In the computation of the crop budget, a standard base such as one acre or one ha should be used. For the cost component, it may be assumed that the total certified seed paddy requirement is purchased, machinery hired and only hired labour is used. Then suitable adjustments can be made to these cost items based on the information collected from participatory socio-economic and agricultural surveys, which are briefly described in AG-01-01 and AG-02-01, or from any other reliable secondary source. For instance, if farmers use their own seed paddy for 4 seasons on average before replacing it with certified seeds, the relevant adjustment to the cost of seed paddy should be made to the final crop budget. Similarly, some farmers use their own tractors for land preparation. In this instance, the relevant cost of machinery should be adjusted based on the percentage of tractor owning farmers in the study area. With regard to labour requirement, the average number of farm labour units available per household can be sought under general house-hold information in the socio-economic survey. Depending on the field operation, the number of labour units that comes from the household should be deducted from the total requirement and cost of labour.

FURTHER INFORMATION

⇒ Final Report Chapter 4 Agriculture
⇒ Annex-B Agriculture

AG-02 Agricultural Assessment

AG-02-03 Crop Budgets

Sample 1: Crop Budget-Paddy Under Present Conditions

Crop	Unit	Paddy: Nachchaduwa				Paddy: Thuruwila				Paddy: Rajangana			
Description		Rate	Qty	Val.Rs.		Rate	Qty	Val.Rs.		Rate	Qty	Val.Rs.	
Yield	kg		4800				5300				4210		
Price	Rs/kg	15				15				15			
Gross Revenue				**72000**				**79500**				**63150**	
Cost of Production													
Planting Materials													
Seeds	kg	28	103	2884		25	103	2575		18	110	1980	
Fertilizer													
Basal	kg	32	100	3200		32	62	1984		32	63	2016	
Urea	kg	13	187	2431		13	149	1937		13	124	1612	
TDM	kg	18	105	1890		18	88	1584		18	44	792	
Paddy Straw	kg		5000	0			5000	0			5000	0	
Pesticides													
Weedicides	kg/l	520	6.5	3380		520	4	2080		520	6.5	3380	
Insecticides	kg/l	520	2.5	1300		570	2.5	1425		520	2.5	1300	
Fungicides	kg/l												
Other Materials													
Bags				350				375				250	
Material Cost					*15435*				*11960*				*11330*
Machinery													
2W Tractor	times	3543	2	7086		3106	2	6212		3075	2	6150	
Combine Thresher	times	6250	1	6250		6250	1	6250		6000	1	6000	
Transport	sum			500				500				700	
Machinery Cost					*13836*				*12962*				*12850*
Labour													
Land Preparation	md	400	11	4400		350	11	3850		350	13	4550	
Sowing/Planting	md	400	10	4000		350	10	3500		350	6	2100	
Fertilizing	md	400	3	1200		350	2	700		350	3	1050	
Spraying	md	450	1	450		350	2	700		350	1	350	
Weeding	md	450	1	450		350	1	350		350	2	700	
Irrigation	md	400	20	8000		350	20	7000		350	20	7000	
Harvesting Contract	md			10000				7500		350	23	8050	
Threshing :Small	md												
:Combine	md	400	2	800		350	2	700		350	2	700	
Winnowing	md												
Bagging/Transporting	md	400	3	1200		350	3	1050		350	3	1050	
Labour Cost with hired lab.		*400*	*51*		*30500*	*350*	*51*		*25350*	*350*	*73*		*25550*
Labour Cost with fam. lab.		*400*	*32*		*22800*	*350*	*26*		*16600*	*350*	*22*		*15750*
Total Cost of Production with hired labour					**59771**				**50272**				**49730**
Total Cost of Production with family labour					**52071**				**41522**				**39930**
Net Income with hired labour					**12229**				**29228**				**13420**
Net Income with Family labour					**19929**				**37978**				**23220**

AG-02 Agricultural Assessment
AG-02-03 Crop Budgets
Sample: Paddy Yield Data

Paddy Production Data of Study Area

Nachchaduwa

Maha	Extent ha	Prodn t	Yield t/ha	Yala	Extent ha	Prodn t	Yield t/ha
97/98				1998	1472	5741	3.90
98/99	2510	11069	4.41	1999	2462	10464	4.25
99/00	2510	11320	4.51	2000	2510	10668	4.25
00/01	2510	12600	5.02	2001	941	4291	4.56
01/02	2510	14985	5.97	2002	992	4276	4.31
02/03	2510	11320	4.51	2003	2800	11060	3.95
03/04	2800	13496	4.82	2004	128		
04/05	2800	13776	4.92				
Total	18150	88566			11305	46498	
Average			4.88				4.11

Rajangana

Maha	Extent ha	Prodn t	Yield t/ha	Yala	Extent ha	Prodn t	Yield t/ha
97/98	5459	23637	4.33	1998	6280	25748	4.10
98/99	6000	28320	4.72	1999	6000	26280	4.38
99/00	6000	27000	4.50	2000	5457	23574	4.32
00/01	5457	28267	5.18	2001	4080	19339	4.74
01/02	5610	27826	4.96	2002	6229	28467	4.57
02/03	5610	26479	4.72				
03/04							
04/05							
Total	34136	161530			28046	123408	
Average			4.73				4.40

Source:Nachchaduw a and Rajangana IE Offices, DOI

Paddy Statistics - Major Irrigation Projects Under GAP: Anuradhapura District

Season	Project	Yld.kg/h (nett)	Yld bu/ac (nett)	Std.Error	95% Confidence Limit Lower	Upper
03/04 Maha	Huruluwewa	4,744		501	3,762	5,726
	Mahakandarawa	4,014		214	3,595	4,433
	Mahawilachchiya	4,209		261	3,697	4,720
	Nachchaduwa	5,986		72	5,844	6,127
	Nuwarawewa	6,347		54	6,237	6,451
	Padaviya	5,429		152	5,131	5,725
	Rajangana	5,780		308	5,175	6,383
	Tissawewa	6,100		232	5,647	6,555
	Wahalkada	6,332		523	5,308	7,357
03 Yala	Huruluwewa	*3,196*	62.37	7.44	47.79	76.95
	Mahakandarawa	*4,271*	83.34	4.48	74.56	92.12
	Mahawilachchiya	*4,492*	87.64	2.44	82.86	92.42
	Nachchaduwa	*4,999*	97.55	12.89	72.29	122.81
	Nuwarawewa	*5,368*	104.75	8.98	87.15	122.35
	Padaviya	*4,621*	90.17	4.12	82.09	98.35
	Rajangana	*4,918*	95.96	6.75	82.73	109.19
	Tissawewa	*4,813*	93.91	4.87	84.36	103.46
	Wahalkada	*5,171*	100.90	8.08	85.06	116.74
05 Yala	Rajangana RB	4,585		282	4,033	5,137
	Rajangana LB	5,563		623	4,344	6,786
	Nachchaduwa	4,527		249	4,039	5,015
	Wahalkada	4,286		332	3,634	4,937
	Padaviya	5,280		71	5,141	5,418
	Huruluwewa	4,649		6	4,636	4,661
	Manankattiya	4,148		8	4,133	4,163
	Nuwarawewa	5,408		427	4,572	6,246

Source: Department of Census and Statistics, DOA

Paddy production Data in Pilot Area

Scheme	FO	Season	Extent ha	Prodn t	Av Yld t/h
Rajangana	Sri Udara	04/05Maha	22.7	95.8	4.22
		05Yala	22.5	94.5	4.20
Nachchaduwa	Isuru	04/05Maha	22.8	110.6	4.85
		05Yala	24.3	115.6	4.76
Thuruwila	Mahanama	04/05Maha	26.4	137.3	5.20
		05Yala	25.2	136.1	5.40

Source: Socio-Economic Survey, JICA Study Team, 2005

Paddy Production Data by Farmer Organizations

Nachchaduwa

FO Name	02/03 Maha			03 Yala			03/04 Maha		
	Extent ha	Prodn. t	Yield t/ha	Extent ha	Prodn. t	Yield t/ha	Extent ha	Prodn. t	Yield t/ha
Senasamagi	164	674	4.1	164	590	3.60	164	337	2.1
Mahasen	200	871	4.4	158	567	3.60	200	264	1.3
Parakumba	144	517	3.6	144	517	3.60	144	516	3.6
Navoda	80	288	3.6	80	288	3.60	80	209	2.6
Ranketha	234	958	4.1	219	1013	4.60	234	227	1
FO: 26/27	204	838	4.1	204	732	3.60	200	0	0
Ruwanveli	230	1178	5.1	216	868	4.00	230	222	1
Tissa	250	1026	4.1	180	462	2.60	250	0	0
Eksath	159	641	4	159	641	4.00	159	640	4
Isuru	141	543	3.9	141	435	3.10	141	543	3.9
Ranamaura	148	608	4.1	113	406	3.60	148	374	2.5
Gemunu	297	989	3.3	190	710	3.70	259	1064	4.1
Wijaya	96	543	5.7	96	494	5.10	96	494	5.1
	2347	9674	4.1	1900	7723	4.10	2305	4890	2.1

Rajangana

FO Name	02/03 Maha			03/04 Maha			04 Yala		
	Extent ha	Prodn. t	Yield t/ha	Extent ha	Prodn. t	Yield t/ha	Extent ha	Prodn. t	Yield t/ha
Sri Udara	139	666	4.8	139	713	5.10	139	773	5.6
Parakum	195	498	2.6	194	897	4.60	194	996	5.1
Sadagala	149	537	3.6	149	572	3.80	149	610	4.1
Saliyagama	156	801	5.1	134	689	5.10	134	659	4.9
Mahasen	159	779	4.9	159	783	4.90	159	721	4.5
Wijaya	165	633	3.8	165	676	4.10	165	591	3.6
	963	3914	4.1	940	4330	4.60	940	4350	4.6

Source: Survey of FOs, JICA Study Team

Paddy Production and Yield /ha

	Anuradhapura District		Kurunegala District		Polonnaruwa District	
Season	Production 000' mt	Av. Yield kg	Production 000' mt	Av. Yield kg	Production 000' mt	Av. Yield kg
Maha 2000/2001	146	4474	160	3601	17	3561
Yala 2001	207	4873	82	3101	20	3423
Maha 2001/2002	198	4627	196	3521	21	3314
Yala 2002	40	4190	165	3207	28	3225
Maha 2002/2003	219	4341	227	3520	40	3108
Yala 2003	68	3891	170	3170	29	3224

Source: Statistical Abstract - 2004, Department of Census and Statistics

Sample 2: Proposed Crop Budgets With Project Condition

Crop	Unit	Paddy: Nachchaduwa			Paddy: Thuruwila			Paddy: Rajangana			Bitter Gourd			Eggplant			Sweet Pumpkin			Maize			Cabbage			Banana		
Description		Rate	Qty	Val.Rs.	Rate	Qty	Val.Rs.	Rate	Qty	Val.Rs.	Rate	Qty	Val.Rs.	Rate	Qty	Val.Rs.	Rate	Qty	Val.Rs.	Rate	Qty	Val.Rs.	Rate	Qty	Val.Rs.	Rate	Qty	Val.Rs.
Yield	kg		5500			6000			5200			20000			17000			20000			6500			40000			15000	
Price	Rs/kg	15			15			15			20			20			14			17.5			10			25		
Gross Revenue				**82500**			**90000**			**78000**			**400000**			**340000**			**280000**			**113750**			**400000**			**375000**
Cost of Production																													
Planting Materials																													
Seeds	kg	28	100	2800	28	100	2800	28	100	2800	4000	6	24000	4000	0.35	1400	3000	1	3000	300	5	1500	33700	0.25	8425			
Suckers																										30	1300	39000
Nursery Management	sum															2000									3000			
Fertilizer																												
Urea	kg	11	260	2860	11	260	2860	11	260	2860	11	225	2475	11	225	2475	11	225	2475	11	250	2750	11	330	3630	11	810	8910
TSP	kg	34	90	3060	34	90	3060	34	90	3060	34	200	6800	34	325	11050	34	200	6800	34	120	4080	34	275	9350	34	540	18360
MOP	kg	32	75	2400	32	75	2400	32	75	2400	32	180	5760	32	170	5440	32	180	5760	32	75	2400	32	150	4800	32	1350	43200
Zinc Sulphate	kg	80	5	400	80	5	400	80	5	400																		
Cowdung	kg										1	5000	5000	1	2000	2000	1	2000	2000				1	5000	5000	1	5000	5000
Green Manure	kg										1	2500	2500										1	2500	2500			
Husk Charcoal	kg	0.5	750	375	0.5	750	375	0.5	750	375	0.5	1000	500	0.5	1000	500							0.5	1000	500			
Paddy Straw	kg		5000	0		5000	0		5000	0	0.5	5000	2500	0.5	5000	2500	0.5	5000		0.5	5000	2500	0.5	5000	2500	0.5	5000	2500
Pesticides																												
Weedicides	kg/l	520	6.5	3380	520	4	2080	500	4	2000	500	4	2000	500	4	2000	500	4	2000	500	4	2000	500	4	2000	500	10	5000
Insecticides	kg/l	520	2.5	1300	570	3	1710	550	3	1650	4500	2	9000	600	3	1800	600	4	2400				1500	6	9000			
Fungicides	kg/l																						1000	6	6000			
Other Materials																												
Trellising	sum												20000															
Bags				1000			1200			1000	20	500	10000	20	400	8000				20	75	1500	20	800	16000			
Material Cost				*17575*			*16885*			*16545*			*90535*			*39165*			*24435*			*16730*			*72705*			*121970*
Machinery																												
2W Tractor	times	3543	2	7086	3106	2	6212	3075	2	6150	3500	2	7000	3500	2	7000	3500	1	3500	3500	1	3500	3500	2	7000	2500	1	2500
4W Tractor	times																											
Back-hoe	times																											
Hand Sprayer	times																											
Small Thesher	times																											
Combine Thresher	times	6250	1	6250	6250	1	6250	6000	1	6000																		
Transport	sum			500			500			500			20000			17000			20000						40000			15000
Machinery Cost				*13836*			*12962*			*12650*			*27000*			*24000*			*23500*			*3500*			*47000*			*17500*
Labour																												
Land Preparation	md	400	11	4400	350	13	4550	350	10	3500	400	37	14800	400	35	14000	400	35	14000	400	25	10000	400	55	22000	400	65	26000
OM Addition	md	400	1	400	350	1	350	350	1	350	400	4	1600	400	4	1600							400	4	1600			
Seed Preparation	md																											
Sowing/Planting	md	400	10	4000	350	10	3500	350	11	3850	350	10	3500	400	15	6000	350	8	2800	350	15	5250	350	15	5250	400	20	8000
Trellising	md										350	25	8750															
Fertilizing	md	400	3	1200	350	3	1050	350	3	1050	350	48	16800	350	64	22400	350	22	7700	350	20	7000	350	64	22400	400	36	14400
Spraying	md	400	1	400	350	1	350	350	1	350	450	40	18000	450	30	13500							400			400	2	800
Weeding	md	400	1	400	350	1	350	350	1	350	350	60	21000	350	60	21000	350	30	10500	350	15	5250	350	60	21000	350	48	16800
Irrigation	md	400	20	8000	350	20	7000	350	20	7000	350	20	7000	350	20	7000	350	12	4200	350	6	2100	350	20	7000	350	72	25200
Harvesting Contract	md			10000	350	1	7500			8000	300	54	16200	350	48	16800	350	30	10500	350	10	3500	350	30	10500	400	25	10000
Threshing :Small	md																			350	8	2800						
:Combine	md							350	2	700																		
Winnowing	md																											
Bagging/Transporting	md	400	4	1600	350	2	700	350	3	1050	400	30	12000	400	22	8800	350	20	7000	350	8	2800	350	20	7000	400	20	8000
Labour Cost with hired lab.		*400*	*51*	*30400*	*350*	*52*	*25350*	*350*	*52*	*26200*	*350*	*328*	*119650*	*350*	*298*	*1E+05*	*350*	*157*	*56700*	*350*	*107*	*107*	*38700*	*350*	*268*	*96750*	*400*	*288*	*109200*
Labour Cost with fam. lab.		*400*	*34*	*23600*	*350*	*27*	*16950*	*350*	*22*	*15700*	*350*	*298*	*104300*	*350*	*268*	*93800*	*350*	*127*	*44450*	*350*	*77*	*26950*	*350*	*238*	*83300*	*400*	*258*	*103200*
Total Cost of Production with hired labour				**61811**			**55197**			**55395**			**237185**			**174265**			**104635**			**58930**			**216455**			**248670**
Total Cost of Production with family labour				**55011**			**46797**			**44895**			**221835**			**156965**			**92385**			**47180**			**203005**			**242670**
Net Income with hired labour				**20689**			**34803**			**22605**			**162815**			**165735**			**175365**			**54820**			**183545**			**126330**
Net Income with Family labour				**27489**			**43203**			**33105**			**178165**			**183035**			**187615**			**66570**			**196995**			**132330**

AG-02	Agricultural Assessment	
AG-02-04	Survey of Agricultural Staff on Field Constraints	
Purpose	➢ To identify the constraints faced by the agricultural field staff in carrying out their assigned duties in order that the issues could be addressed in future planning.	
Working Group	➢ AD Agriculture ➢ Agricultural Instructor (AI) ➢ Resident Project Manager (IMD) ➢ Irrigation Assistant ➢ DO (ASC)	
Output	➢ Report presenting the constraints of the AIs in carrying out their assigned duties	
Work Procedure	(1) ***Method of data collection:*** A simple questionnaire method could be applied, where a short questionnaire on the information required is handed over to the officer to complete. This can be done at a regular meeting time, e.g., the monthly progress meeting of the AIs where the questionnaires are distributed after a short briefing. (2) ***Administration of the questionnaire:*** A senior officer from the working group, who could provide clarifications when required, should be made responsible to take charge of the survey. (3) ***Presentation:*** The data collected could be analyzed and presented in tabular form indication the priorities according to the responses.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Stationery	**FORMATS** ➢ FORM-16 (Sample form of a questionnaire) ➢ See in the next page (sample of data)

FURTHER INFORMATION
⇒ Final Report Chapter 4 Agriculture ⇒ Annex-B Agriculture

AG-02 Agricultural Assessment
AG-02-04 Survey of Agricultural Staff on Constraints

Sample

Training of Agricultural Instructors 2004/05

Subject	2004			2004		
	No.Trained	Period (d)	% Trained	No.Trained	Period (d)	% Trained
Micro-irrigation	7	5	53.85	1	5	7.69
Integrated Pest Management	10	1 - 3	76.92	12	1 - 3	92.31
Water Management	1	2	7.69			
Village Development				2	2	15.38
Cyber Extension				1	5	7.69
Granary Area Program	1	5	7.69			
IPM Vegetables				1	5	7.69
No Training	2		15.38	1		7.69

Source: Survey of Officers Als. JICA Study Team

Training Needs Identified by Agricultural Instructors

Subject	No of Resp	%	Subject	No of Resp	%
Computer Training	10	15.87	Landscaping	8	12.70
IPM	7	11.11	Bee Keeping	7	11.11
Micro-irrigation	5	7.94	Farm Machinery	5	7.94
Floriculture	4	6.35	Water Management	4	6.35
Extn. Methodology	3	4.76	Tissue Culture	3	4.76
OFC Agronomy	2	3.17	Marketing	1	1.59
Horticulture	1	1.59	Food Processing	1	1.59
Farm Management	1	1.59	Project Planning	1	1.59

Source: Survey of Officers Als. JICA Study Team

Constraints in Carrying out Duties Identified by Agricultural Instructors

Constraint	Nachchaduwa		Rajangana		Study area	
	No of Resp	%	No of Resp	%	No of Resp	%
Time lost due to tansport problem	3	16.67	7	15.91	10	16.13
Poor farmer participation in training	3	16.67	6	13.64	9	14.52
Difficult to coordinate marketing	3	16.67	2	4.55	5	8.06
Delayed transfer of technologies	3	16.67	1	2.27	4	6.45
Lack of modern teaching aids	4	22.22	6	13.64	10	16.13
Insufficient travelling allowance	1	5.56	9	20.45	10	16.13
Lack of bi-weekly training	1	5.56	0	0.00	1	1.61
Performance not assessed	0	0.00	1	2.27	1	1.61
No regular in-service training	0	0.00	1	2.27	1	1.61
Poor extension planning	0	0.00	2	4.55	2	3.23
Lack of residential facilities	0	0.00	3	6.82	3	4.84
No training on other related areas	0	0.00	4	9.09	4	6.45
Poor road conditions	0	0.00	2	4.55	2	3.23

Source: Survey of Officers Als. JICA Study Team

Constraints of Farmers Identified by Agricultural Instructors

Constraint	Nachchaduwa		Rajangana		Study area	
	No of Resp	%	No of Resp	%	No of Resp	%
Shortage of water	2	7.69	0	0.00	2	2.70
Poor irrigation system	4	15.38	4	8.33	8	10.81
Poor water management	4	15.38	2	4.17	6	8.11
No field ownership	3	11.54	0	0.00	3	4.05
Marketing problems	4	15.38	8	16.67	12	16.22
Shortage of good quality seeds	4	15.38	10	20.83	14	18.92
Legal issues on growing OFCs	3	11.54	0	0.00	3	4.05
Shortage of agric. machinery	1	3.85	0	0.00	1	1.35
Lack of unity	1	3.85	1	2.08	2	2.70
Poor marketing strategies	0	0.00	2	4.17	2	2.70
High labour wages	0	0.00	1	2.08	1	1.35
High cost of pesticides	0	0.00	1	2.08	1	1.35
High cost of OFC seeds	0	0.00	1	2.08	1	1.35
High cost of farm equipment	0	0.00	1	2.08	1	1.35
Poor transport facilities	0	0.00	8	16.67	8	10.81
Poor maintenance of pumps (Lift)	0	0.00	1	2.08	1	1.35
Lack of standards for inputs	0	0.00	1	2.08	1	1.35
Ineffective agrarian services	0	0.00	1	2.08	1	1.35
Financial problems	0	0.00	5	10.42	5	6.76
Unidentified diseases	0	0.00	1	2.08	1	1.35

Source: Survey of Officers Als. JICA Study Team

AG-03	Improvement Direction	
AG-03-01	Problems and Approaches	
Purpose	➢ To identify the problems and development approaches to be applied in the agriculture sector for improvement of the present conditions and maximization of farm income.	
Working Group	➢ AD Agriculture ➢ Irrigation Engineer ➢ Sector AO/SMOs ➢ Agricultural Instructor (AI) ➢ Resident Project Manager (IMD) ➢ Irrigation Assistant ➢ DO (ASC) ➢ ARPAs ➢ Farmer Organization	
Output	➢ Capacity development approach for the agriculture sector based on the analysis of problems and causes	
Work Procedure	(1) ***Method of data collection:*** Data and information on problems and issues is a pre-requisite for formulation of the approaches for development. Primary data needed should be collected through a series of studies covering socio-economic and agricultural situation and supplemented by PCM workshops with the participation of stakeholders at all levels. Sample survey by questionnaire method, Participatory Rural Appraisals by administering semi-structured interviews to individuals, key informants, groups and focus groups can be applied for this purpose. The basic work procedures of some of these techniques are presented in AG-01-01, and AG-02-01 (2) ***Study:*** A senior officer from the working group should be appointed for the purpose.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢	**FORMATS** ➢ Refer AP-01-01

FURTHER INFORMATION
⇒ Final Report Chapter 4 Agriculture
⇒ Annex-C Irrigation O&M and Water Management

Sample 1: Problems & Issues and Approaches for Agricultural Improvement

Category	Problems & Issues	Approaches
1. Paddy 1.1Low Productivity	1. Low sustainability of yield levels achieved in field demonstrations 2.Low adoption of recommended practices	1. Empowerment of FOs to improve access to inputs, credit and machinery through capacity development 2. Tract demonstrations with farmer training for adoption of DOA recommended package on cropping practices 3. Facilitation for establishment of seed farms for production of certified seed paddy and self-seed production of secondary seeds through FOs and FCGs' 4. Minimizing post harvest field losses and improving the paddy quality
1.2.High Cost of Production	1.High cost of labour due to shortage 2.High cost of fertilizers and agrochemicals	1. Facilitation to organize private sector and banks for mechanization of farm operations 2. Facilitation of 'Attam' labour exchange system where applicable 3. Facilitation for FOs for bulk purchase of inputs, particularly agrochemicals and fertilizers, as means of cost reduction 4. Facilitation for adoption of Integrated Pest Management practices as means of preventing wasteful use of agrochemicals while maintaining environmental safety
2. Weak Agricultural Extension	1.Extension efforts not sustained at field level after demonstrations 2. Poor participation of farmers at training sessions	1. Capacity development of the officials on follow-up, monitoring & evaluation on extension programs implemented in the field 2. Re-commencing pre-seasonal training on a regular basis at relevant In-service Training Institutes 3. Capacity development of the extension staff on communication and extension methodology 4. Capacity development of the extension agent to play the role of farmer facilitator.

3. Crop Diversification	1. Unstable crop yields and market	1. Facilitation for selection of crops and crop varieties that are adapted to the climatic conditions of the area 2. Facilitation for selection of lands that are suitable for diversification 3. Facilitation to work out economies of diversification based on profitability, production costs and marketability
4. Off Farm Income	1. Poor coordination among organizations involved in promoting off farm income generating activities	1. Facilitation for participation of representatives of all such organizations in PMC meetings conducted by IMD in order to formulate integrated development strategies.

Chapter 5

M-01	Basic Data Collection	
M-01-01	National level basic data collection	
Purpose	➢ To acquire information on government policy on marketing of agricultural products, crop diversification, rates of import tariffs, etc. so as to understand the general circumstances of the agricultural sector.	
Working Group	➢ Irrigation Department (ID) Head Office ➢ Department of Agriculture (DOA) Head Office ➢ Provincial Government Office	
Output	➢ List of Import of Agricultural Commodities ➢ List of Export of Agricultural Commodities ➢ Rates of Import Tariffs ➢ National Production of Agricultural Commodities by each provinces ➢ Relative prices of Rice ➢ Price Fluctuation of Agricultural Commodities ➢ Agricultural Credit Schemes	
Work Procedure	(1) Data collection: Necessary data should be collected at various institutes such as Department of Customs, HARTI (Hector Kobbekaduwa Agrarian Research and Training), BOC (Bank Of Ceylon), CBSL (Central Bank of Sri Lanka), NSB (National Saving Bank), Department of Census and Statistics, CRCS (Comprehensive Rural Credit Scheme), FAO (United Nation Food and agriculture Organization) and various Webb-sites through Internet Service. (2) Study Team members: Team members should be appointed from Working Group for the purpose. (3) Analysis of data and identification of the background and long-term trend, etc. for the Project.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Secondary data and information	**FORMATS**

Tips

(1) A huge amount of information is available from websites nowadays. Utilization of the Internet in an intelligent manner will enable access to accurate and updated data.

FURTHER INFORMATION

⇒ Final Report Chapter 2, National and Regional Background

⇒ Annex D Marketing Aspect, Chapter 1, 1.2 Macro-level Market Information

Samples of data collected and analyzed

Sample 1: Rice production, Imports and Consumption

Year	①Production* ('000ton)	②Imports ('000ton)	③Import ratio (②/①) %	④Consumption ('000ton)
1994	1,745	58	3.3	1,709
1995	1,826	9	0.5	1,728
1996	1,340	341	25.4	1,749
1997	1,455	306	21.0	1,770
1998	1,750	167	9.5	1,794
1999	1,856	214	11.5	1,821
2000	1,859	14	0.7	1,847
2001	1,751	51	2.9	1,873
2002	1,859	95	5.1	1,901
2003	1,996	28	1.4	1,925
2004	1,717	314	18.3	NA

Note: * Production figures are of milled rice calculated as 65% of paddy production.
Source: Hector Kobbekaduwa Agrarian Research and Training Institute)

Sample 2: Imports of Agricultural Commodities (unit: metric ton)

	2000	2001	2002	2003	2004
Maize	123,112	157,402	94,595	136,698	148,866
Green gram	6,767	8,717	7,121	8,200	12,700
Black gram	7,332	7,891	6,939	7,597	NA
Chilies (dried)	23,364	25,898	25,337	27,686	24,323
Kurakkan (millet)	552	816	1,134	610	1,829

Source: Department of Census and Statistic

Sample 3: Rates of Import tariff imposed on Selected Agricultural Commodities

Products	Tariff (%)			
	1986/88	1994	1996	1998-2005
Rice	25	35 or Rs 7/kg	35	35
Maize	5	45	35	35
Potato	100	35 or Rs12/kg	35	35
Red Onions	5	35 or Rs 9/kg	35	35
B Onions	5	35 or Rs 9/kg	35	35
Green gram	5	35 or Rs10/kg	35	35
Black gram	5	35 or Rs10/kg	35	35
Dried Chilies	5	35 or Rs20/kg	35	35

Source: Sri Lanka Custom Notifications, Department of Customs, (1986/88; 1996; 1998), Report of the Presidential Commission on Tariff and Trade- 1994.

Sample 4: Relative Rice Prices

Ratio (Rice price/input prices, consumers prices)	1982	1992	2002
Rice / Fertilizer (Rs/kg)	1.37	0.70	0.78
Rice / Labor charges (Rs/hour)	0.80	0.69	0.45
Rice / Kerosene oil	0.81	0.89	0.66

M-01	Basic Data Collection	
M-01-02	Provincial level basic data collection	
Purpose	➢ To acquire information on agricultural production, marketable surplus, and price fluctuations at the provincial level so as to understand the general circumstances of the agricultural sector in the province.	
Working Group	➢ Irrigation Engineer (IE) ➢ Agricultural Instructor (AI) ➢ Resident Project Manager (RPM) ➢ Farmers' Organization (FO) ➢ Development Officer (DO) at Agrarian Service Center (ASC) ➢ Department of Census and Statistics ➢ Development Assistance (DA)	
Output	➢ Production and marketable surplus of Agricultural Products, Average Monthly Price Fluctuation, etc.	
Work Procedure	(1) Data Collection: Necessary data should be collected at various institutions such as District Offices, Department of Census and Statistics, Agrarian Service Center Offices and etc. (2) Study Team member: Team member should be appointed from Working Group for the purpose. (3) Analysis of data and identification of the background and long-term trends, etc. for project planning and/or implementation. (4) Collected data and information should be owned jointly among the target group.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Various data and information	**FORMATS**

Tips

(1) In order to analyze the overall situation, collection of various information from multiple sources and comprehensive analysis are important.

FURTHER INFORMATION

⇒ Final Report Chapter 3, Present Condition of the Study Areas, 3.5 Marketing Aspect

⇒ Annex D Marketing

Sample 1: Productions and Marketable Surplus of Paddy in the Study Areas in Maha, 2004/2005

Crop	Total production (MT) in Maha 2004 /2005		Save for seed		Payment for labor		Self-consumption and other use		Marketable surplus (MT)	
	Nachch	Raja	Nachch	Raja	Nachch	Raja	Nachch	Raja	Nachch	Raja
Paddy	13,397	25,705	7%	5%	12%	10%	26%	20%	55% (7,370)	65% (16,700)

Note: Nachch=Nachchaduwa, Raja=Rajangana

Source: Department of Census and Statistics, Anuradhapura, District Agriculture Office, Anuradhapura and Agrarian Service Center Office, Rajangana.

Sample2: Average Monthly Producers' Prices

Table Average Monthly Producer price of Paddy in Sri Lanka 2000-2004 (Unit Price:Rs/Kg)

	2000	2001	2002	2003	2004	Aver
Jan	12.10	12.72	15.02	14.32	14.45	**13.72**
Feb	10.67	12.10	14.86	12.86	14.04	**12.91**
Mar	10.25	12.21	13.18	12.08	13.63	**12.27**
Apr	10.77	12.12	13.17	12.08	14.40	**12.51**
May	10.54	11.52	13.45	12.14	14.97	**12.52**
Jun	10.57	12.28	13.67	12.42	15.01	**12.79**
Jul	11.09	12.32	13.22	12.45	16.10	**13.04**
Aug	11.64	12.49	12.82	12.08	16.03	**13.01**
Sep	10.66	12.17	13.46	11.85	16.92	**13.01**
Oct	10.32	12.73	13.84	12.05	16.87	**13.16**
Nov	11.51	13.36	13.76	13.06	18.05	**13.95**
Dec	12.68	13.66	14.28	14.02	17.85	**14.50**
Ave.	11.08	12.47	13.76	12.60	15.66	**13.11**

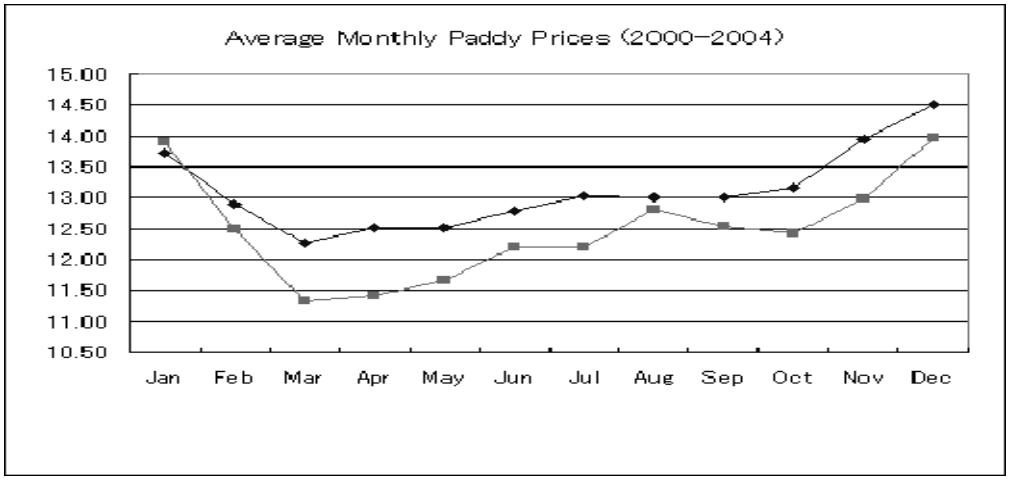
Sources :Department of Census and Statistics

Table Average Monthly Producer price of Paddy in Anuradhapura district 2000-2004

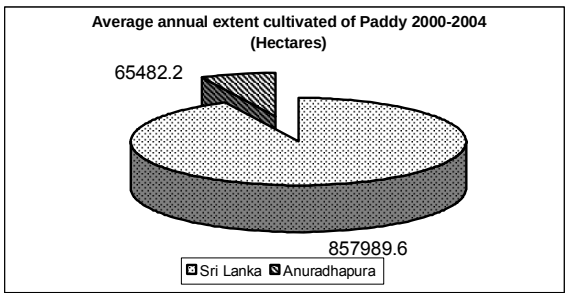
	2000	2001	2002	2003	2004	Aver
Jan	12.25	12.19	14.44	15.26	15.32	**13.89**
Feb	10.93	12.26	13.38	11.15	14.79	**12.50**
Mar	7.94	11.98	12.38	11.08	13.23	**11.32**
Apr	10.83	10.75	12.71	10.95	11.88	**11.42**
May	9.54	11.68	13.02	10.45	13.64	**11.67**
Jun	10.50	11.53	12.76	12.05	14.14	**12.20**
Jul	10.43	12.09	12.25	11.01	15.23	**12.20**
Aug	12.75	12.24	12.54	10.71	15.80	**12.81**
Sep	10.06	11.77	11.99	10.87	18.01	**12.54**
Oct	10.48	12.49	12.25	11.42	15.47	**12.42**
Nov	10.38	12.24	13.65	13.37	15.25	**12.98**
Dec	11.59	12.88	15.00	14.10	16.30	**13.97**
Ave.	10.64	12.01	13.03	11.87	14.92	**12.49**

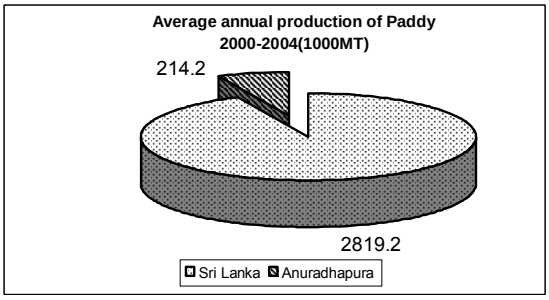
Sources :Department of Census and Statistics

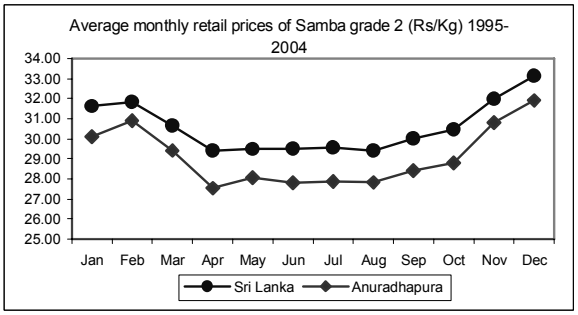
Sample 3: Average Monthly Paddy Price Fluctuation

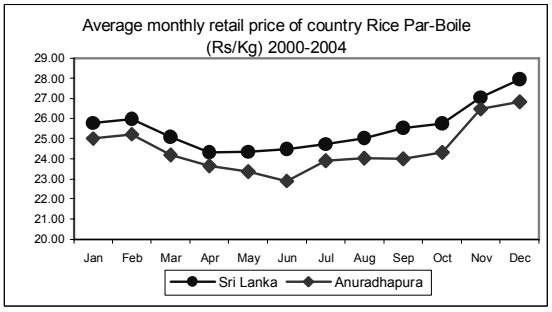


Sample 4: Paddy Production and price fluctuation in Anuradhapura Province.









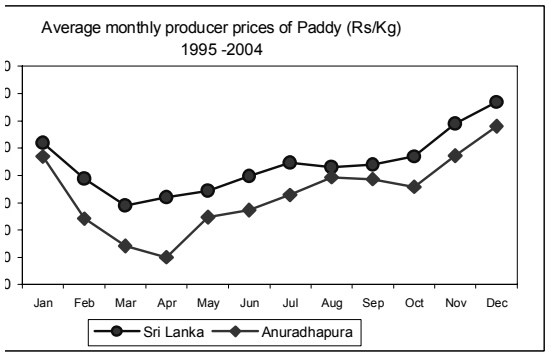


Table 1.1 Extent cultivated & Production of Paddy in Anuradhapura district as compare to Sri Lanka

Season/Year	Sri Lanka		Anuradhapura	
	Extent Cultivated (hectares)	Production (1000 MT)	Extent Cultivated (hectares)	Production (1000 MT)
2000 Maha	549246	1781	56543	192
2000 Yala	328748	1079	21213	68
Total	877994	2860	77756	260
2001 Maha	478986	1613	40799	146
2001 Yala	319273	1082	17507	62
Total	798259	2695	58306	208
2002 Maha	510403	1774	47191	164
2002 Yala	342126	1086	12347	40
Total	852529	2860	59538	204
2003 Maha	601584	1895	66055	219
2003 Yala	381033	1177	23570	68
Total	982617	3072	89625	287
2004 Maha	520662	1670	39098	102
2004 Yala	257887	939	3088	10
Total	778549	2609	42186	112
Average Maha	532176	1747	49937	165
Yala	325813	1073	15545	50
Annual	857990	2819	65482	214

Sources :Department of Census and Statistics

Table1.2 Average Monthly Producer price of Paddy in Sri Lanka 1995-2004 (Unit Price:Rs/Kg)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Aver
January	8.45	8.22	11.27	12.48	11.84	12.10	12.72	15.02	14.32	14.45	12.09
February	8.07	8.49	10.59	10.02	12.66	10.67	12.10	14.86	12.86	14.04	11.44
March	7.38	8.14	10.06	9.98	12.50	10.25	12.21	13.18	12.08	13.63	10.94
April	7.44	8.54	10.08	9.74	12.59	10.77	12.12	13.17	12.08	14.40	11.09
May	7.78	8.79	10.11	9.99	12.90	10.54	11.52	13.45	12.14	14.97	11.22
June	7.95	9.59	10.13	10.32	12.90	10.57	12.28	13.67	12.42	15.01	11.48
July	8.20	10.16	10.41	10.21	13.09	11.09	12.32	13.22	12.45	16.10	11.73
August	7.33	10.60	10.83	9.90	12.80	11.64	12.49	12.82	12.08	16.03	11.65
September	7.83	11.08	10.97	9.60	12.40	10.66	12.17	13.46	11.85	16.92	11.69
October	7.42	10.99	11.46	9.97	12.77	10.32	12.73	13.84	12.05	16.87	11.84
November	7.85	11.59	12.03	10.61	12.60	11.51	13.36	13.76	13.06	18.05	12.44
December	8.18	11.84	11.96	11.12	12.83	12.68	13.66	14.28	14.02	17.85	12.84
Annu Aver	7.83	9.95	10.80	10.25	12.66	11.08	12.47	13.76	12.60	15.66	11.71

Sources :Department of Census and Statistics

Table1.3 Average Monthly Producer price of Paddy in Anuradhapura district 1995-2004 (Unit Price:Rs/Kg)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Aver
January	7.00	8.42	9.98	12.02	11.60	12.25	12.19	14.44	15.26	15.32	11.85
February	6.60	7.52	8.78	9.37	12.27	10.93	12.26	13.38	11.15	14.79	10.71
March	6.75	7.73	9.42	9.11	12.39	7.94	11.98	12.38	11.08	13.23	10.20
April	6.46	7.87	9.41	8.92	10.25	10.83	10.75	12.71	10.95	11.88	10.00
May	7.46	7.98	10.30	10.67	12.58	9.54	11.68	13.02	10.45	13.64	10.73
June	6.98	8.70	10.25	10.16	11.62	10.50	11.53	12.76	12.05	14.14	10.87
July	7.12	10.05	10.67	10.64	11.91	10.43	12.09	12.25	11.01	15.23	11.14
August	6.78	10.39	10.79	10.55	12.07	12.75	12.24	12.54	10.71	15.80	11.46
September	6.81	11.89	10.54	10.10	12.25	10.06	11.77	11.99	10.87	18.01	11.43
October	6.63	10.08	11.66	10.19	12.23	10.48	12.49	12.25	11.42	15.47	11.29
November	7.00	11.59	12.09	10.70	12.38	10.38	12.24	13.65	13.37	15.25	11.87
December	7.30	10.85	12.04	11.34	12.55	11.59	12.88	15.00	14.10	16.30	12.40
Annu Aver	6.91	9.42	10.49	10.31	12.01	10.64	12.01	13.03	11.87	14.92	11.16

Sources :Department of Census and Statistics

M-02	Paddy/Rice	
M-02-01	Paddy/Rice Marketing	
Purpose	➢ To undertake intensive study of paddy and rice marketing routes for the maximization of farmer benefits. Problems and issues should be identified for the actions to be taken by the officials and farmers.	
Working Group	➢ Irrigation Engineer (IE) ➢ Agricultural Instructor (AI) ➢ Resident Project Manager (RPM) ➢ Farmers' Organization (FO) ➢ Development Officer (DO) at Agrarian Service Center (ASC) ➢ Department of Census and Statistics ➢ Development Assistance (DA)	
Output	➢ Paddy/Rice Marketing Flow and its volume	
Work Procedure	(1) Questionnaire: the Target Group in consultation with other relevant institutions should prepare a questionnaire for the assessment. (A sample questionnaire is attached [FORM M-01] for reference. (2) Study Team members: Team members should be appointed from Working Group for the purpose. (3) Survey: Questionnaire survey should be conducted by PRA (Participatory Rural Appraisal) with farmer leaders. Additional interview survey at random to stakeholders such as Farmers, Commercial Rice Mills, Village Rice Mills (Custom Mill), Collectors/Middlemen, Mudarali, Wholesalers and Retailers. (4) Data Compilation: Collected data through the survey should be compiled and summarized by the Study Team.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS**	**FORMATS** ➢ FORM-17 (Sample Technical Specification and Questionnaire

Tips

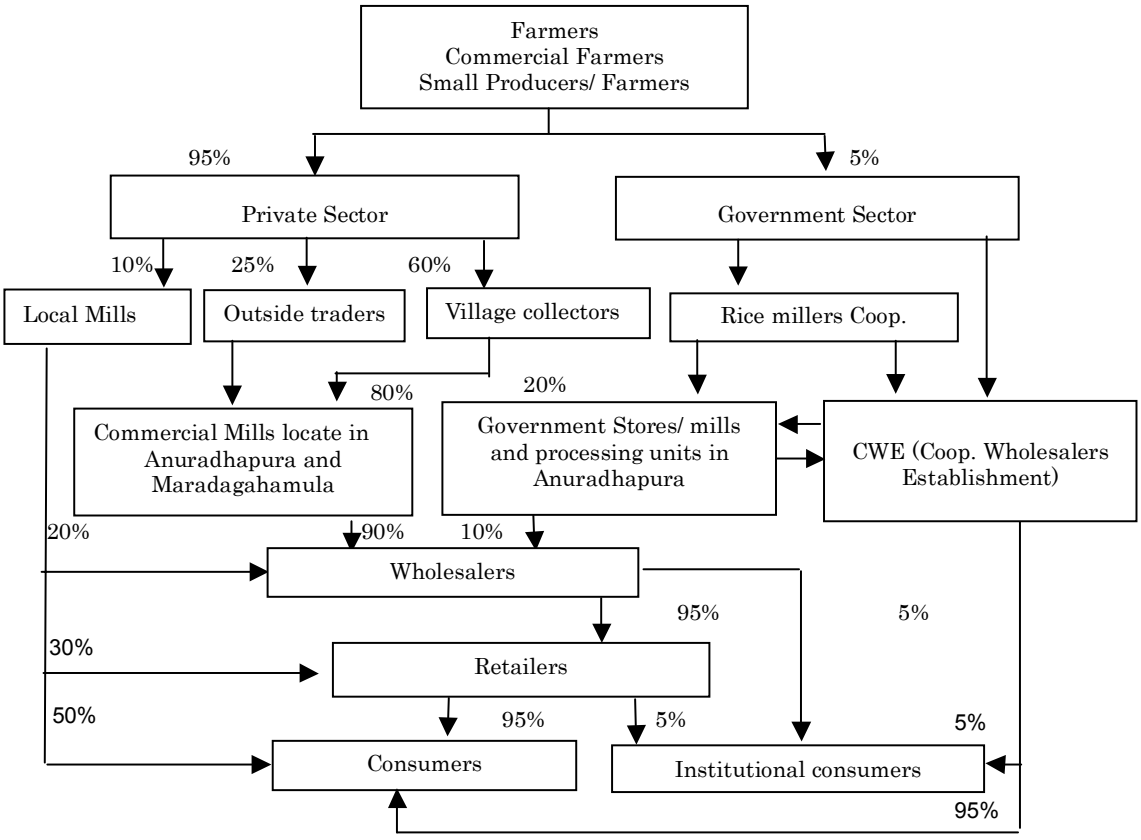
(1) Not only the Marketing Flow of agricultural commodities, but also the volume of each flow is useful to grasp the real Marketing Flow in the target area.

FURTHER INFORMATION

⇒ Final Report Chapter 3, Present Condition of the Study Areas, 3.5 Marketing Aspect

⇒ Annex D Marketing⇒ Final Report

Sample 1: Marketing Flow of Paddy/Rice and its volume



M-02	Paddy/Rice	
M-02-02	Price Formulation	
Purpose	➢ To undertake intensive study of price formulation system in paddy and rice marketing for the maximization of farmer benefits. Problems and issues should be identified for actions to be taken by the officials and farmers.	
Working Group	➢ Irrigation Engineer (IE) ➢ Agricultural Instructor (AI) ➢ Resident Project Manager (RPM) ➢ Farmers' Organization (FO) ➢ Development Officer (DO) at Agrarian Service Center (ASC) ➢ Department of Census and Statistics ➢ Development Assistance (DA)	
Output	➢ Price Formulation from farm-gate to retailer. Several varieties and parboiled and raw rice should be included for comparison.	
Work Procedure	(1) Questionnaire: the Target Group in consultation with other relevant institutions should prepare a questionnaire for the assessment. (A sample questionnaire is attached [FORM M-01] for reference. (2) Study Team members: Team members should be appointed from Working Group for the purpose. (3) Survey: The questionnaire survey should be conducted by PRA (Participatory Rural Appraisal) with farmer leaders. Additional interview survey at random to stakeholders such as Farmers, Commercial Rice Mills, Village Rice Mills (Custom Mill), Collectors/Middlemen, Mudarali, Wholesalers and Retailers. (4) Data Compilation: Collected data through the survey should be compiled and summarized by the Study Team.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Questionnaire (M-01)	**FORMATS**

Tips

(1) It is very difficult to obtain accurate information on price formulation from the stakeholders; consideration and analysis from every possible angle are necessary.

FURTHER INFORMATION

⇒ Final Report Chapter 3, Present Condition of the Study Areas, 3.5 Marketing Aspect

⇒ Annex D Marketing

Sample 1: Study result of Price Formulation

	Samba (Rs/kg)	Nadu (Rs/kg)
Paddy prices; Farmers' selling price to Mudarali	11.0~12.0	10.0~11.0
Paddy prices; Rice millers buying price including collectors' margin & trans. cost	14.0~17.0	13.0~14.5
Milling cost and margin	9.0~12.0	9.0~12.0
Rice prices; Ex-Rice mill	23.0~29.0	22.0~26.5
Wholesalers' buying prices including transport and handling cost	25.0~31.0	24.0~28.5
Wholesale price	37.0~41.0	28.0~30.0
Wholesalers' margin	10.0~12.0	2.0~4.0
Wholesalers' margin (%)	25~30 %	10~15 %
Retailers' buying prices including transport cost	39.0~42.0	29.0~31.0
Consumers' prices in Colombo	43.0~46.0	33.0~34.0
Retailers' margin	Approx. 10%	Approx. 10%

Source: Study team basing on price level of March 2006 in Anuradhapura for paddy and in Colombo for rice.

M-02	Paddy/Rice	
M-02-03	Issues and Approaches	
Purpose	➢ To undertake intensive study of Problems/Issues and Approaches to be taken in Marketing and Price Formulation in Paddy/Rice to improve the situation for the maximization of farmer benefits. Through analysis of problems and issues, the approach to be taken should be identified.	
Working Group	➢ Irrigation Engineer (IE) ➢ Agricultural Instructor (AI) ➢ Resident Project Manager (RPM) ➢ Development Officer (DO) at Agrarian Service Center (ASC) ➢ Department of Census and Statistics ➢ Development Assistance (DA) ➢ Farmers' Organization (FO)	
Output	➢ Capacity development approach for marketing sector ➢ Proposed lists of Approach to be taken	
Work Procedure	(1) Questionnaire: the Target Group in consultation with other relevant institutions should prepare a questionnaire for the assessment. (A sample questionnaire is attached [FORM M-01] for reference. (2) Study Team members: Team members should be appointed from Working Group for the purpose. (3) Survey: Questionnaire survey should be conducted by PRA (Participatory Rural Appraisal) with farmer leaders. Additional interview survey at random to stakeholders such as Farmers, Commercial Rice Mills, Village Rice Mills (Custom Mill), Collectors/Middlemen, Mudarali, Wholesalers and Retailers. (4) Project Cycle Management (PCM) Workshop: PCM should be held to identify Problems, Objectives, Alternatives and Project Design Matrix should be discussed and concluded by participants (See Manual C-01).	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS**	**FORMATS** ➢ Refer AP-01-01

Tips

(1) Problems and Issues can be obtained through the intensive questionnaire survey, but the approach and activities to be taken require broad and comprehensive research, knowledge and experience. PCM workshop and group discussion including brainstorming among the study team and working group is useful.

FURTHER INFORMATION

⇒ Final Report Chapter 3, Present Condition of the Study Areas, 3.5 Marketing Aspect

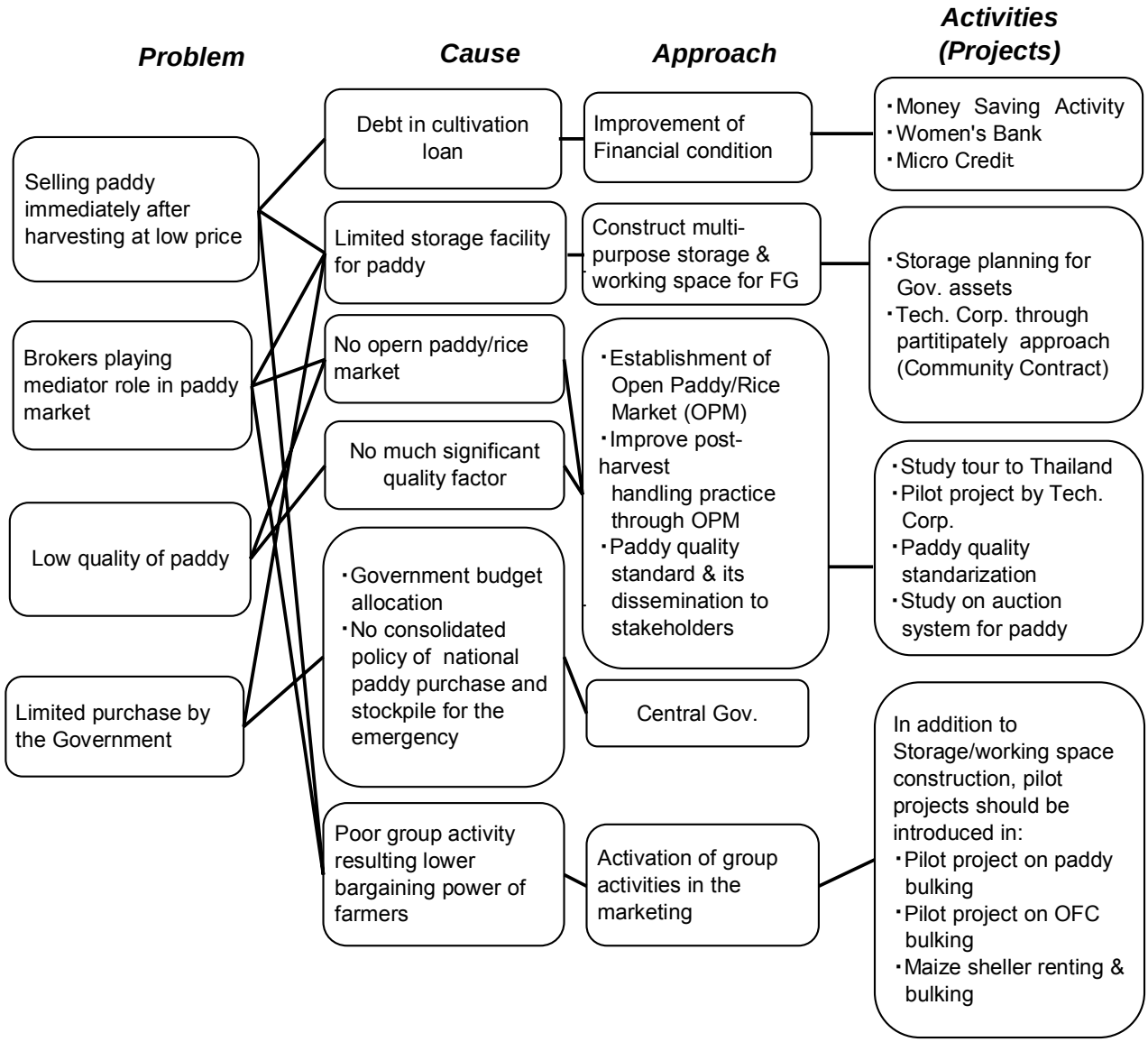
⇒ Annex D Marketing

Sample 1: Problems/Issues and Approaches for Paddy/Rice Marketing

Category	Problems and Issues	Approaches
Paddy	General and Common Points	
	1. Many farmers sell paddy at low price for settlement of credit	1. Improve the situation by farmers' own efforts and outside support .
	2.Shortage of paddy storage	2.Construct storages and capacity building for operation and management of those storages. 2.1 Multipurpose storage for Agrarian Service Center for storing paddy/fertilizer/etc. 2.2 Multipurpose storage for Farmers group (FO) for storing paddy, paddy seed, other grain and salable resources like coconuts fibers. (Participatory construction approach will enforce farmers' ownership)
	3. No market available for paddy and rice	3. Study the setting up of an Open Paddy/Rice Market (OPM) for necessity and effectiveness in increasing farmers' income. 3.1 Arrange study tour to Thailand where OPM is effectively functioning for the benefit of farmers, rice millers and collectors/middlemen. 3.2 Apply to donor agencies including JICA to conduct feasibility study. 3.3 Introduce auction system for paddy sales by farmer groups to rice millers/brokers
	4. Inactive group marketing for stronger bargaining power by farmers	4. Facilitation of farmers group for collective activities 4.1 Capacity building of government officers for the facilitation of group activity to farmers. 4.2 Extension of awareness training of the benefits by group activities to farmers. 4.3 Training of management skills for group activity.
	5. Poor quality control of paddy	5. Improve post harvest-processing technologies of farmer. 5.1 Extension of post-harvest technologies 5.2 Awareness training to farmers, rice millers and middlemen for the benefits of high quality paddy.
	6. Insufficient paddy purchased by government	6.1 Approach government to increase the budget 6.2 Approach local ASC to increase purchasing and storage capability.
	7. Deterioration of Feeder roads.	7. Planning of road maintenance and its execution. 7.1 Increase government budgets. 7.2 Communal repair works

Category	Problems and Issues	Approaches
	Particular Situation in Rajangana Major Scheme	
	1. Selling price of paddy is low due to limited direct access to rice mills.	1.1 Direct sale to large-scale rice millers at better price through bulking and quality control of paddy. 1.2 Awareness training to farmers for the benefits of bulking and collective sales. 1.3Construct paddy storage and quality control training and machine input. (Participatory construction approach will enforce farmers enrollment in the scheme) 1.4 Facilitation of farmers' group activity by government agencies.
	2.Number of commercial rice mills is low.	2. Create incentives to facilitate the commercial sector to invest in new commercial rice mills.

Sample 2: Capacity Development Approach and Activities for Marketing of Paddy/Rice



M-02	Paddy/Rice	
M-02-04	Rice Processing and Marketing	
Purpose	➢ To increase value adding activity to generate income for farmers	
Working Group	➢ Irrigation Engineer (IE) ➢ Agricultural Instructor (AI) ➢ Resident Project Manager (RPM) ➢ Development Officer (DO) at Agrarian Service Center (ASC) ➢ Department of Census and Statistics ➢ Development Assistance (DA) ➢ Farmers' Organization (FO) ➢ Farmers' Group	
Output	➢ Plan of promotion of Rice Processing Village or Cottage Rice Mill	
Work Procedure	(1) Identification of villages/farmers groups who wish to start rice-milling activity. (2) Study Team Members: Team members should be appointed from Working Group. (3) Feasibility Study by the study team Following information should be collected and feasibility study should be made by the team: ① Milled rice market, price, quality and quantity ② Milling technology and equipment available ③ Investment plan ④ Financial plan/loan and repayment plan ⑤ Operation and maintenance plan ⑥ Management and accounting plan	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Feasibility study	**FORMATS**

Tips

(1) Feasibility study requires not only an investment and operation plan, but also an acquisition plan for the market, which is very important for the project to be successful.

FURTHER INFORMATION

⇒ Final Report Chapter 3, Present Condition of the Study Areas, 3.5 Marketing Aspect

⇒ Annex D Marketing

Sample 1: Feasibility Study of Cottage Rice Mill

Condition

1. Annual Processing Amount of Paddy	40MT/year (planned); 380kg/day x 3days/week x 4weeks/month x 12months/year
2. Cost of Paddy	Rs15.0/kg
3. Milling Recovery	70%
4. Milled Rice Price (sales price)	Rs30.0/kg
5. Depreciation period	6 years for machines, no reserves for cottage

Investment Plan

Description	Units	Price	Remarks
1. Parboiling facility (Soaking vessel, Steaming pan, Sun-drying yard)	1 lot	Rs.	
2. Rice Milling Machine	1 set	Rs.	
3. Husk Aspirator and pipes	1 lot	Rs.	
4. Electric Motor & Cable works	1 lot	Rs.	
5. Machine Foundation works	1 lot	Rs.	
6. Auxiliary equipment	1 lot	Rs.	
Total		Rs.	

Operation Cost

1. Wages	1 lot	Rs.	
2. Repair fee	1 lot	Rs.	Calculate as 5% of machines
3. Consumable spare parts	1 lot	Rs.	Screen, etc.
4. Electricity, Water, Fire-woods, etc.	1 lot	Rs.	
5. Taxes, Loan Repayment	1 lot	Rs.	
Total		Rs.	

Total Expenses: Rs xxxxx

Income Plan

1. Rice Sales	Rs 840,000	40 ton x 0.7 x Rs30/kg x 1,000
2. Rice Bran Sales	Rs.	
3. Others	Rs.	
Total		

Operation Profits Plan: (Income) – (Total expenses) = Rs 00000.

M-03	OFC/Vegetable/Fruits	
M-03-01	Marketing	
Purpose	➢ To undertake intensive study of OFC/Vegetable/Fruits marketing route for the maximization of farmer benefits. Problems and issues should be identified for actions to be taken by the officials and farmers.	
Working Group	➢ Irrigation Engineer (IE) ➢ Agricultural Instructor (AI) ➢ Resident Project Manager (RPM) ➢ Development Officer (DO) at Agrarian Service Center (ASC) ➢ Department of Census and Statistics ➢ Development Assistance (DA) ➢ Farmers' Organization (FO)	
Output	➢ OFC/Vegetable/Fruits Marketing Flow and its volume	
Work Procedure	(1) Questionnaire: the Target Group in consultation with other relevant institutions should prepare a questionnaire for the assessment. (A sample questionnaire is attached [FORM M-01] for reference. (2) Study Team members: Team members should be appointed from Working Group for the purpose. (3) Survey: Questionnaire survey should be conducted by PRA (Participatory Rural Appraisal) with farmer leaders. Additional interview survey at random to stakeholders such as Village Collectors, Transporter, Collectors/Middlemen, FSC (Forward Sales Contract), Wholesalers, Dedicated Economic Center and Retailers. (4) Data Compilation: Collected data through the survey should be compiled and summarized by the Study Team.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS**	**FORMATS** ➢ FORM-17 (Sample Technical Specification and Questionnaire)

Tips

(1) Not only the Marketing Flow of agricultural commodities, but also the volume of each flow is useful to grasp the real Marketing Flow in the target area.

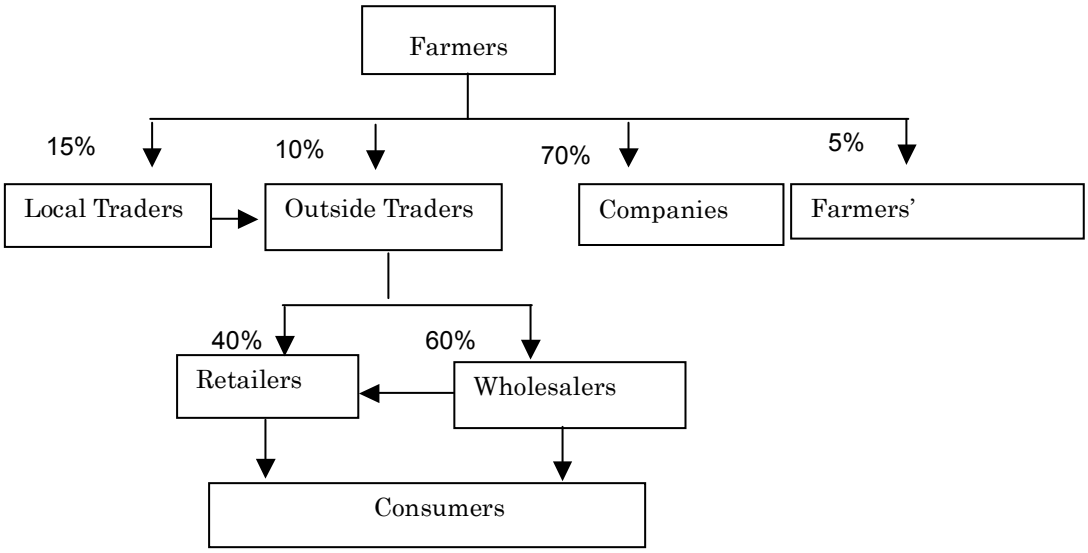
FURTHER INFORMATION

⇒ Final Report Chapter 3, Present Condition of the Study Areas, 3.5 Marketing Aspect

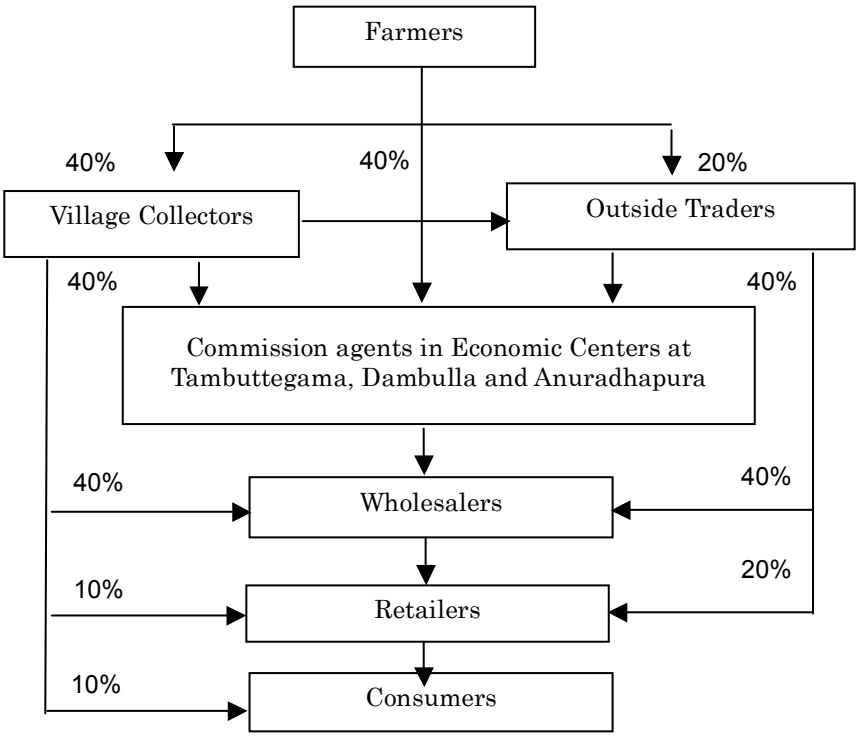
⇒ Annex D Marketing

Sample 1: Marketing Flow of OFC

Marketing Flow of OFC in Nachchaduwa

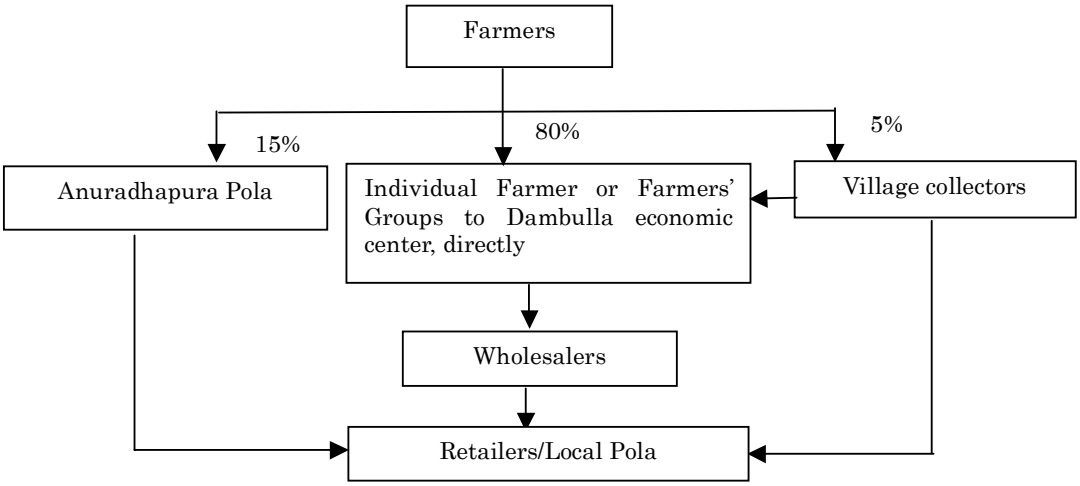


Marketing Flow of OFC in Rajangana

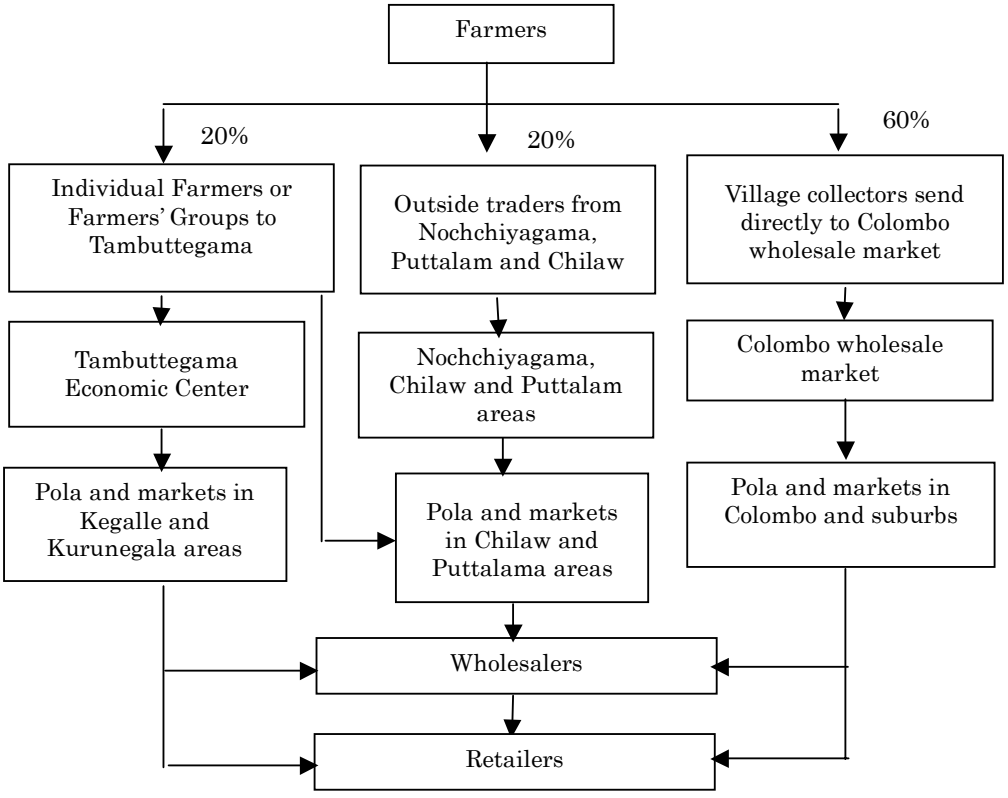


Sample 2 Marketing Flow of Vegetables

Marketing Flow of Vegetables in Nachchaduwa



Marketing Flow of Vegetables in Rajangana



M-03	OFC/Vegetable/Fruits	
M-03-02	Price Formulation	
Purpose	➢ To undertake intensive study of the price formulation system in OFC/Vegetable/Fruits marketing for the maximization of farmer benefits. Problems and issues should be identified for actions to be taken by the officials and farmers.	
Working Group	➢ Irrigation Engineer (IE) ➢ Agricultural Instructor (AI) ➢ Resident Project Manager (RPM) ➢ Development Officer (DO) at Agrarian Service Center (ASC) ➢ Department of Census and Statistics ➢ Development Assistance (DA) ➢ Farmers' Organization (FO)	
Output	➢ Price Formulation from farm-gate to retailer. Several commodities such as perishable and non-perishable products should be studied.	
Work Procedure	(1) Questionnaire: the Target Group in consultation with other relevant institutions should prepare the questionnaire for the assessment. (A sample questionnaire is attached [FORM M-01] for reference. (2) Study Team members: Team members should be appointed from Working Group for the purpose. (3) Survey: The questionnaire survey should be conducted by PRA (Participatory Rural Appraisal) with farmer leaders. Additional interview survey at random to stakeholders such as Village Collectors, Transporters, Collectors/Middlemen, FSC (Forward Sales Contract), Wholesalers, Dedicated Economic Center and Retailers. (4) Data Compilation: Collected data through the survey should be compiled and summarized by the Study Team.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS**	**FORMATS** ➢ FORM-17 (Sample Technical Specification and Questionnaire)

Tips

(1) It is very difficult to obtain accurate information on price formulation from the stakeholders; consideration and analysis from every possible angle are necessary.

FURTHER INFORMATION

⇒ Final Report Chapter 3, Present Condition of the Study Areas, 3.5 Marketing Aspect

⇒ Annex D Marketing

Sample 1: Price Formulation of OFC/Vegetable/Fruits

Price Formulation of Some OFC in Colombo

Marketing channel	Kurakkan(millet) (Rs/kg)	Maize (Rs/kg)	Black gram (Rs/kg)	Green gram (Rs/kg)	Cowpea (Rs/kg)
Farmers	30	15	30	40	50
Collectors' margin and trans. Cost	10	10	10	15	12
Wholesalers buying cost	40	25	40	55	62
Wholesalers selling price	45	40	60	65	90
Wholesalers margin	5	15	20	10	28
Margin rate	11%	38%	33%	15%	31%
Retailers buying price	46	41	61	66	91
Retail price Colombo	48	45	65	70	92
Price difference between Farmers' and Consumers' in Colombo (times)	1.60	3.0	2.17	1.75	1.84

Source: Study Team, Data collected in November 2005.

Price Formulation of Some Vegetables in Colombo

Marketing channel	Chillies (Rs/kg)	Eggplant (Rs/kg)	Bitter gourd (Rs/kg)	Pumpkin (Rs/kg)	Cucumber (Rs/kg)
Farmers	70	20	30	13	5
Collectors' margin and trans. Cost	6	10	10	4	3
Wholesalers buying cost	76	30	40	17	8
Wholesalers selling price	85	33	46	19	9
Wholesalers margin	9	3	6	2	1
Margin rate	11%	9%	13%	10%	11%
Retailers buying price	86	34	47	20	10
Retail price Colombo	96	38	60	22	12
Price difference between Farmers' and Consumers' in Colombo (times)	1.37	1.90	2.00	1.69	1.84

Source: Study Team, Data collected in November 2005.

Price Formulation of Some Fruits in Colombo

Marketing channel	Banana (Rs/kg)	papaw (Rs/kg)	Mango (Rs/nut)	Coconut (Rs/nut)
Farmers	13	15	7	10
Collectors' margin and trans. cost	7	2	5	3
Wholesalers buying cost	20	17	12	13
Wholesalers selling price	21	24	15	15
Wholesalers margin	1	7	3	2
Margin rate	5%	29%	20%	13%
Retailers buying price	22	25	16	16
Retail price in Colombo	25	30	20	20
Price difference between Farmers' and Consumers' in Colombo (times)	1.92	2.00	2.86	2.00

Source: Study Team, Data collected in November 2005.

M-03	OFC/Vegetable/Fruits	
M-03-03	Issues and approaches	
Purpose	➢ To undertake intensive study of problems/Issues and approaches to be taken in Marketing and Price Formulation in OFC/Vegetable/Fruits to improve the situation for the maximization of farmer benefits.	
Working Group	➢ Irrigation Engineer (IE) ➢ Agricultural Instructor (AI) ➢ Resident Project Manager (RPM) ➢ Development Officer (DO) at Agrarian Service Center (ASC) ➢ Department of Census and Statistics ➢ Development Assistance (DA) ➢ Farmers' Organization (FO)	
Output	➢ Capacity development approach for marketing sector.	
Work Procedure	(1) Questionnaire: the Target Group in consultation with other relevant institutions should prepare a questionnaire for the assessment. (A sample questionnaire is attached [FORM M-01] for reference. (2) Study Team members: Team members should be appointed from Working Group for the purpose. (3) Survey: Questionnaire survey should be conducted by PRA (Participatory Rural Appraisal) with farmer leaders. Additional interview survey at random to stakeholders such as Farmers, Village Collectors, Transporters, Dedicated Economic Centers and Retailers. (4) Data Compilation: Collected data through the survey should be compiled and summarized by the Study Team.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS**	**FORMATS** ➢ FORM-17 (Sample Technical Specification and Questionnaire)

Tips

(1) Problems and Issues can be obtained through the intensive questionnaire survey, but the approach and activities to be taken require broad and comprehensive research, knowledge and experience. PCM Workshop and group discussion including brainstorming among the study team and working group is useful.

FURTHER INFORMATION

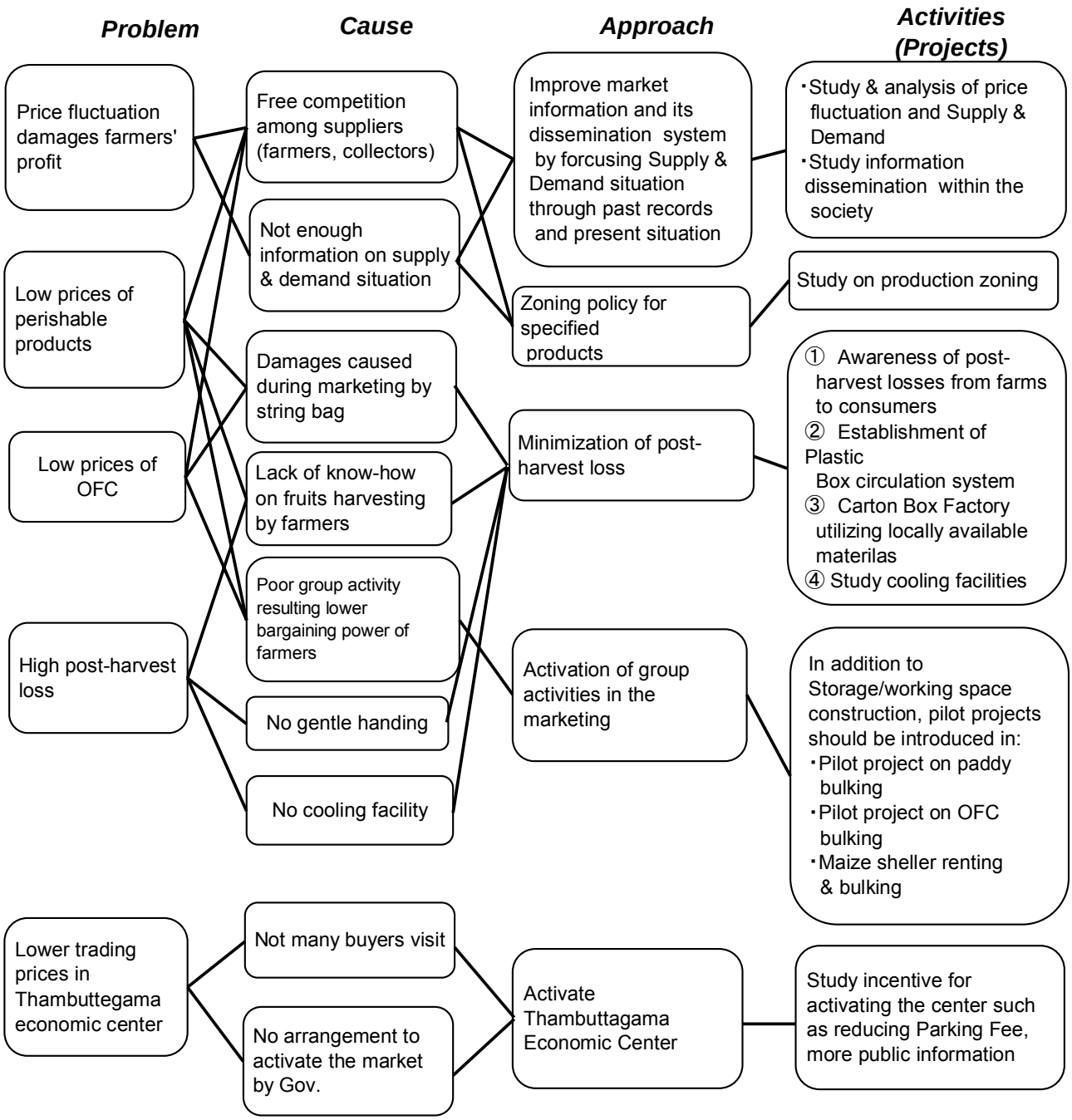
⇒ Final Report Chapter 3, Present Condition of the Study Areas, 3.5 Marketing Aspect

⇒ Annex D Marketing

Sample 1: Problems/Issues and Approach for OFC/Vegetables/Fruits

Category	Problem and Issues	Approaches
Marketing and Processing of OFC, Vegetable & Fruits		
1. Price fluctuation	・ Price fluctuation of vegetable and fruits ・ Free competition among suppliers	(i) Systematic recording of such fluctuation and its dissemination to farmers for their benefit. (ii) Zoning policy for specified products
2. Inactive group activity	・ Group marketing activity is rare	(i) Facilitation of farmers groups for collective activity. (ii) Construct a consolidating station.
3. Low prices of perishable products	・ Farm gate prices are low but wholesalers and retailers' margin is high on perishable products due to very high post-harvest losses	(i) Extension of gentle post-harvest handling practice for minimizing damage to perishable products (ii) Introduction of plastic boxes, carton boxes and cold storage practices
4. Lack of know-how on fruits harvesting products	・ Farmers lack know-how in appropriate fruit harvesting	(i) Dissemination of appropriate technologies and training
5. Forward sales contract in made by individual farmers	・ Forward sales contract in made by individual farmers	Facilitation of farmers group for collective activities (i) Capacity development of government officers for the facilitation of group activity to farmers. (ii) Extension of awareness training of the benefits by group activities to farmers. (iii) Training in management skills for farmers group.
6. High post-harvest loss	・ Post-harvest loss is very high	(i) Extension of post-harvest technologies to farmers and traders. (ii) Extend plastic boxes in the marketing with system for returning boxes to suppliers. (iii) Construct carton box factory for low cost box production utilizing local available materials.
	Particular Situation in Nachchaduwa Major Scheme and Thuruwila Medium Scheme	
	・ Many farmers started vegetable cultivation and supply produce to Dambulla directly and there is no cooling facility and buffering function	(i) Study pre-cooling facility and cold storage (ii) Study the buffering function
	Particular Situation in Rajangana Major Scheme	
	・ Thambuttegama Economic Center (wholesale market) is not lively in business, resulting in relatively low trade prices	(i) Incentives should be applied for active transaction to all stakeholders who use this facility

Sample 2: Capacity Development Approach and Activities for Marketing of OFC/Vegetables/Fruits



M-04	Other Income Generation	
M-04-01	Other Income Generation	
Purpose	➢ To enhance value adding activities and utilization of available resources for income generation of farmers	
Working Group	➢ Irrigation Engineer (IE) ➢ Agricultural Instructor (AI) ➢ Resident Project Manager (RPM) ➢ Development Officer (DO) at Agrarian Service Center (ASC) ➢ Department of Census and Statistics ➢ Development Assistance (DA) ➢ Farmers' Organization (FO) ➢ Farmers' Group	
Output	➢ Plan of promotion for value adding activities and utilization of available resources for income generation of farmers.	
Work Procedure	(1) Identification of FOs or farmers groups who wish to start value adding activities. (2) Identification of available resources in the area for income generation (3) Study Team Members: Team members should be appointed from Working Group for the purpose. (4) Feasibility Study of various planned activities by the study team. The following activities should be studied by the team: ① Pulse Processing. ② Grinding of rice, chili and others. ③ Coconut fiber marketing by bulking activities. ④ Cow-dung collection and manure production. ⑤ Any other activities, which are available and feasible.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS**	**FORMATS**

Tips

(1) The Output requires broad and comprehensive research, knowledge and experience. PCM workshop and group discussion including brainstorming among the study team and working group is useful.

FURTHER INFORMATION

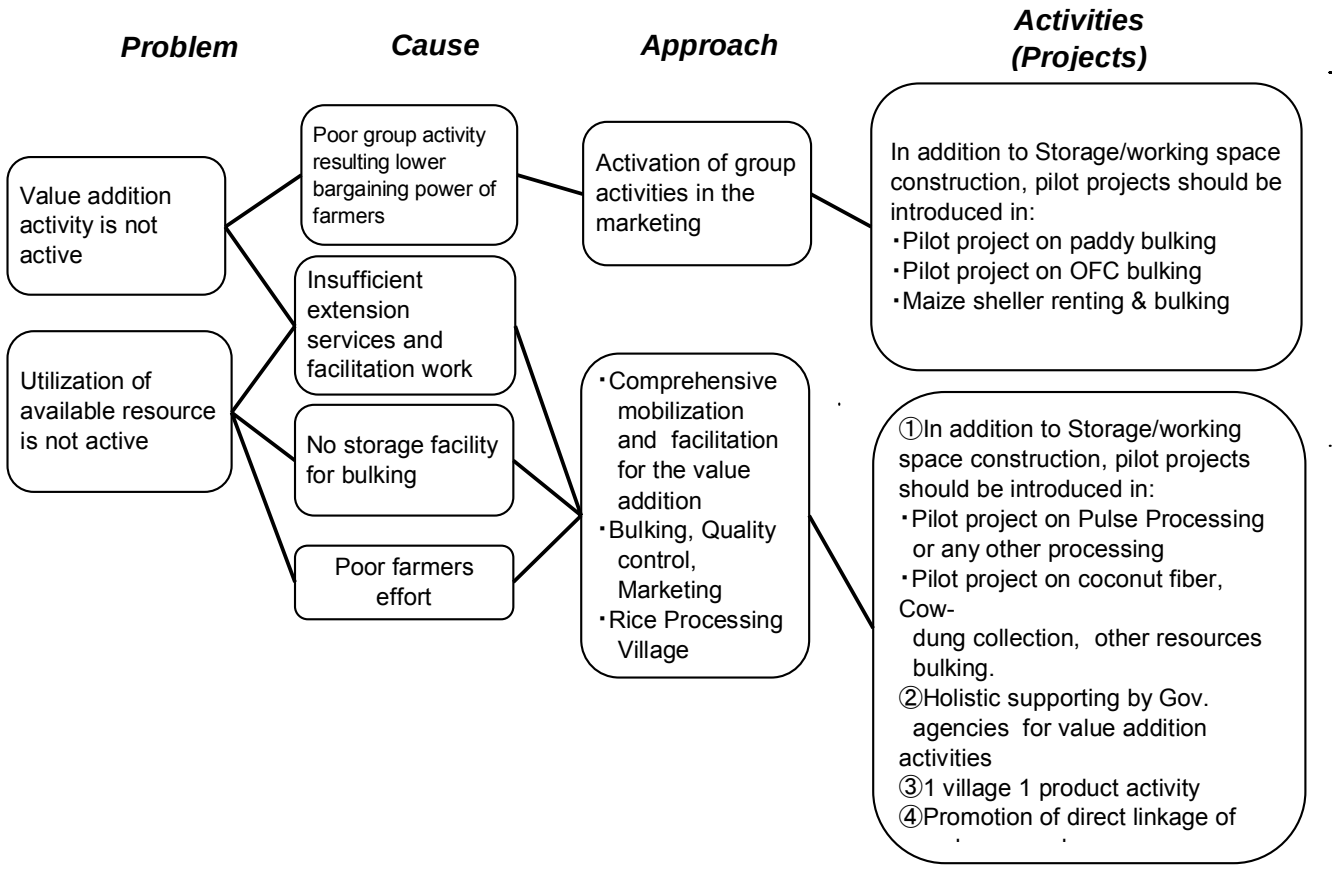
⇒ Final Report Chapter 3, Present Condition of the Study Areas, 3.5 Marketing Aspect

⇒ Annex D Marketing

Sample 1: Problems and Approach Analysis

Category	Problem Description	Approach
Other income generation through Marketing & Processing		
1. Value adding activity is not active	・ Value adding activities on agricultural products is not active	(i) Comprehensive approach by technical, financial and social supports are required.
2. Available resources are not utilized	・ Available resources are not properly utilized	(i) To construct storage facilities and marketing activities by group.

Sample 2: Capacity Development Approach and Activities for Other Income Generation



Chapter 6

FO-01	Survey of Farmers' Organization
FO-01-01	Method of survey for the condition of FO regarding basic information
Purpose	➢ To explore the condition of Farmers' Organization (FO), in particular regarding **basic information**, activities, and problems faced in order to understand the conditions and to formulate a basic approach.
Working Group/ Study Team	Working Group ➢ Resident Project Manager (RPM) at Irrigation Management Division (IMD) ➢ Institutional Development Officer (IDO) at IMD ➢ Development Assistance (DA) at IMD ➢ Irrigation Engineer (IE) at Irrigation Department (ID) ➢ Engineering Assistant (EA) at ID ➢ Assistance Government Agent (Divisional Secretary) ➢ Land Officer ➢ Grama Niladhari (GN) ➢ Divisional Officer (DO) at Agrarian Service Centre (ASC) ➢ Agricultural Research and Productivity Assistant (ARPA) at ASC ➢ Agricultural Instructor (AI) ➢ Other related agencies Study Team ➢ Resident Project Manager (RPM) at Irrigation Management Division (IMD) as a Team leader for Large Irrigation Scheme ➢ Institutional Development Officer (IDO) at IMD ➢ Development Assistance (DA) at IMD ➢ Irrigation Engineer (IE) at Irrigation Department (ID) as a Team Leader for Medium Irrigation Scheme ➢ Engineering Assistant (EA) at ID ➢ Agricultural Research and Productivity Assistant (ARPA) at ASC
Output	➢ Basic information on related FOs ➢ Material based on basic information for considering basic approach.
Work Procedure	(1) ***Formulation of the survey objectives and questionnaire with establishing working group***: The survey objectives formulated by IMD and/or ID are confirmed by the working group. The study team formulates the survey questionnaire, and the working group could suggest improvements to its content. (2) ***Implementation of the survey***: The study team carries out the survey based on the questionnaire to target FOs. (3) ***Data collection and analysis***: The study team produces a data collection table and analyzes the data. (4) ***Sharing result of data analysis***: The study team shares the results of the data analysis with the working group, other related agencies, and the FO.

Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Existing survey reports of FO	**FORMATS** ➢ Questionnaire referred by the result of "Study on Irrigation Management of FO" and "Field Survey of FO".

What is basic information for FO ?

The basic information has to be a common standard. This is simply because the basic information has to show the common conditions of the target FO, that is, the number of FCG, number of members, year established, and so on. In other words, the contents of the basic information cannot depend simply on its objectives.

The basic information can be divided into the following three types:

1) Condition of the number of FCG and establishment, including legal condition

2) Condition of the membership and the officials

3) Condition of official meetings

General questionnaire format

The general questionnaire format for basic information is proposed here, but the format can be modified by referring to the FO's background and objectives. Major points for formulation of a questionnaire are as follows:

- Clearer objectives and word meaning
- Time of questionnaire (one and a half hours is reasonable, but sometimes three or four hours)
- Data collection for comparative method by using numbers
- More precise information by referring various document under FO

1) <u>Condition of establishment including legal condition</u>

The following questions should be directed to representatives of the FO:

1)-a: Name of FO. Name of villages mainly covered including percentage of villages covered.

1)-b: How many FCG do you have? How much irrigated extent (ha)?

1)-c: Do you have official registration under the Agrarian Act? If yes, please show internal regulation.

1)-d: Any changes since original regulation? If yes, describe it.

With respect to 1)-c, the procedure for official registration has to involve formulation of internal regulation, and it is then not necessary to ask the year that internal regulations were formulated. Standard Internal regulations formulated under the Department of Agrarian Development generally is used for internal regulations. If there were any changes to the original regulation, the process of changed regulation could be produced by the positive attitude.

There are many seasonal operators who are not members of an FO. That leads to difficulties to

encourage FO members to achieve unity or to accurately identify the numbers. Most of the FOs in the study area do not ask the members for an annual fee, which makes it even more difficult to acquire precisely the numbers including seasonal operators. If this is the case, another survey of all FCG is required to establish the present number of operators.

2) Condition of the membership and the officials

The following questions should be directed to representatives of FO:

2)-a: How many members are in each FCG (male and female)? → total figure is the number of FO.

2)-b: Male or female? How many years has each officer serviced?

2)-c: Do you collect an entrance membership fee or annual membership fee? How much are they?

3) Condition of official meeting

FO

3)-a: Annual general meeting? Yes (1) or not (0)?

If yes, what are the agenda items? (1: Administration (election of the officers), 2: Water management, 3: Maintenance of facilities, 4: Development activities, 5: Others).

What should be the attendance? (1: All of FO members, 2: A representative of each FCG, 3: All FO committee members, 4: Others)

: Monthly committee meeting; How often? (1: Monthly or more often, 2: 5~6 times per year, 3: 3-4 times per year, 4: 1-2 times per year, 5: None)

What were the major agenda items at the last two meetings (1: Administration, 2: Water management, 3: Maintenance of facilities, 4: Economic activities, 5: Others)

FCG

3)-b: Any regular meeting? Yes (1) or not (0)?

If yes, what are the agenda items? (1: Administration (election of the officers), 2: Water management, 3: Maintenance of facilities, 4: Economic activities, 5: Others).

Data collection format

As mentioned earlier, one of the major points is to compare the FO with other FOs through the questionnaire. In addition, identifying average figures is also an important point. It is then quite important to collect data based on numbers. The data collection format can be divided into two types, such as FO and FCG, because the number of FCGs is sometimes more than 10.

For the purpose, the following formats are suggested.

Data collection format for FO

	FO								
	General Information					Office Bearers			
			Extent	Official		Presiden		Secretary	
Name	Village	FCG	(ha)	Registration	Changes	Age	Service.	Age	Service
	A (%)	Num.	Num.	1 or 0	1 or 0	Num.	Num.	Num.	Num.
A FO	B (%)				Description				
B FO									

Data collection format for FO

FO									
Office Bearers		Membership Fee				Official Meeting			
Treasury		Entrance fee		Annual fee		General Meeting		Committee Meeting	
Age	Service	Yes/No	Fee.	Yes/ No	Fee	Agenda	Attend.	Often	Agenda
Num.	Num.	1 or 0	Num.	1 or 0	Num.	1-5	1-4	1-5	1-5

Data collection format for FCG

A FO										
Name	Extent	Office Bearers						Official Meeting		
	(ha)	President		Secretary		Treasury		Regular Meeting		
		Age	Service	Age	Service	Age	Service	Yes/ No	Often	Agenda
A FCG	Num.	Num.	Num.	Num.	Num.	Num.	Num.	1 or 0	1-5	1-5
B FCG										

FURTHER INFORMATION

⇒ Final Report Chapter 3 Farmers' Organization (FO)

⇒ Annex-C Farmers' Organization

⇒ Project Management & Consultancy Services, May 2005, *Study on Irrigation Management of Farmer Organizations in Nachchaduwa Irrigation Scheme (*JICA, Colombo)

FO-01	Survey of Farmers' Organization
FO-01-02	Method of survey for the condition of FO regarding activities
Purpose	➢ To explore the condition of Farmers' Organization (FO), in particular regarding basic information, **activities**, and problems faced in order to understand the conditions and to formulate a basic approach.
Working Group/ Study Team	Working Group ➢ Resident Project Manager (RPM) at Irrigation Management Division (IMD) ➢ Institutional Development Officer (IDO) at IMD ➢ Development Assistance (DA) at IMD ➢ Irrigation Engineer (IE) at Irrigation Department (ID) ➢ Engineering Assistant (EA) at ID ➢ Assistance Government Agent (Divisional Secretary) ➢ Land Officer ➢ Grama Niladhari (GN) ➢ Divisional Officer (DO) at Agrarian Service Centre (ASC) ➢ Agricultural Research and Productivity Assistant (ARPA) at ASC ➢ Agricultural Instructor (AI) ➢ Other related agencies Study Team ➢ Resident Project Manager (RPM) at Irrigation Management Division (IMD) as a Team leader for Large Irrigation Scheme ➢ Institutional Development Officer (IDO) at IMD ➢ Development Assistance (DA) at IMD ➢ Irrigation Engineer (IE) at Irrigation Department (ID) as a Team Leader for Medium Irrigation Scheme ➢ Engineering Assistant (EA) at ID ➢ Agricultural Research and Productivity Assistant (ARPA) at ASC
Output	➢ Activity data of related FOs ➢ Material based on activity data for considering basic approach.
Work Procedure	(1) ***Formulation of questionnaire***: The survey objectives formulated by IMD and/or the working group confirms ID. The study team formulates the survey questionnaire, and the working group could suggest improvements to its content. (2) ***Implementation of the survey***: The study team carries out the survey based on the questionnaire to target FOs. (3) ***Data collection and analysis***: The study team produces a data collection table and analyzes the data. (4) ***Sharing result of data analysis***: The study team shares the results of the data analysis with the working group, other related agencies, and the FO.

Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Existing survey reports of FO	**FORMATS** ➢ Questionnaire referred by the result of "Study on Irrigation Management of FO" and "Field Survey of FO".

What is activity data in FO?

Activities of Farmers' Organization can be divided into two types as follows:

- Operation & Maintenance of Distribution and Field Canal under FO
- Development activities

O&M is a necessary activity of all FOs, but some FOs do not undertake it properly. There are two major reasons for improper implementation of O&M: i) lack of unity, and ii) lack of funds. Development activities of FOs are introduced for multiple purposes. Economic and welfare activities under FO are both regarded as development activities. Group purchase and selling, management of micro credit, and marketing, including storage management, are economic activity. Support of basic human needs, such as construction of a community hall or nursery school are welfare activities. It is possible for the FO to support welfare activities by arranging funds provided by economic activities.

Activities questionnaire format

Questionnaire format for the operation & maintenance and economic and welfare activities is proposed here, but the format can be modified by referring to the FO's background and its objectives. Major points for formulation of a questionnaire are as follows:

- Clearer objectives and word meaning
- Time of questionnaire (one and a half hours is reasonable, but sometimes three or four hours)
- Data collection for comparative method by using numbers
- More precise information by referring to various documents under FO

1) <u>Condition of the operation & maintenance for D-canal and F-canal</u>

These are some of the questions that should be asked to representatives of FO or FCG:

1)-a: Condition of regular collection fee for O&M. What are the collected funds used for?

1)-b: What kind of activities for O&M do you carry out?

1)-c: Any support from ID? (1: technical, 2: financial (how much), 3: others)

1)-d: Do you implement rehabilitation work based on community funded by ID? If yes, when, how much for last work?

1)-e: How do you think about ownership of D-canal or F-canal? (1: FO, 2: ID, 3: FO, but with ID support, 4: others)

1)-f: If you do not feel ownership of the canal, why, any suggestion for building ownership?

From 19-a to 1)-d questions draw focus on the present condition. Though O&M of D and F canals is legally handed over to FO from ID, some FOs do not build their own ownership of the D and F canal. Thus, 1)-d question is quite important.

2) Condition of economic activities

These are questions that should be asked to representatives of FO:

2)-a: Do you implement any economic activities? If yes, what type of activities? (1: group purchase, 2: micro credit, 3: storage management, 4: group marketing, 5: others)

2)-b: Any planned economic activities? If yes, what type of activities? (1: group purchase, 2: micro credit, 3: storage management, 4: group marketing, 5: others)

2)-c: Do you face any difficulties in implementation of economic activities? Please describe.

2)-d: How do you think of economic activities under FO? (1: very active, 2: good, 3: not good, 4: not necessary) Why? Please describe.

3) Condition of welfare activities

These are the questions that should be asked to representatives of FO:

3)-a: Do you implement any welfare activities? If yes, please describe.

3)-b: Any planned welfare activities? If yes, describe.

3)-c: Do you face any difficulties in implementation of welfare activities? Please describe.

Data collection format

The following formats are proposed in line with the questionnaire:

Data collection format for O & M

	O & M												
	O & M Fee			O & M Activities			Support	Rehabilitation			Ownership		
Name	Y/N	Fee	What	Y/N	D	F	ID	Y/N	when	Cost	D	F	Suggestion
A FO	1/0			1/0			1-3	1/0			1-4	1-4	
B FO													

Data collection format for economic activities

	Economic Activities						
Name	Y/N	Activities	Y/N	Activities (plan)	Difficulties	Attitude	Why
A FO	1/0		1/0			1-4	

Data collection format for welfare activities

	Welfare Activities				
Name	Y/N	Activities	Y/N	Activities (plan)	Difficulties
A FO	1/0		1/0		

FURTHER INFORMATION

⇒ Final Report Chapter 3 Farmers' Organization (FO)

⇒ Annex-C Farmers' Organization

⇒ Project Management & Consultancy Services, May 2005, *Study on Irrigation Management of Farmer Organizations in Nachchaduwa Irrigation Scheme (*JICA, Colombo)

FO-01	Survey of Farmers' Organization
FO-01-03	Method of survey for the condition of FO regarding problems it is facing
Purpose	➢ To explore the condition of Farmers' Organization (FO), in particular regarding basic data, activities, and **problems faced** in order to understand the conditions and to formulate a basic approach.
Working Group/ Study Team	Working Group ➢ Resident Project Manager (RPM) at Irrigation Management Division (IMD) ➢ Institutional Development Officer (IDO) at IMD ➢ Development Assistance (DA) at IMD ➢ Irrigation Engineer (IE) at Irrigation Department (ID) ➢ Engineering Assistant (EA) at ID ➢ Assistance Government Agent (Divisional Secretary) ➢ Land Officer ➢ Grama Niladhari (GN) ➢ Divisional Officer (DO) at Agrarian Service Centre (ASC) ➢ Agricultural Research and Productivity Assistant (ARPA) at ASC ➢ Agricultural Instructor (AI) ➢ Other related agencies Study Team ➢ Resident Project Manager (RPM) at Irrigation Management Division (IMD) as a Team leader for Large Irrigation Scheme ➢ Institutional Development Officer (IDO) at IMD ➢ Development Assistance (DA) at IMD ➢ Irrigation Engineer (IE) at Irrigation Department (ID) as a Team Leader for Medium Irrigation Scheme ➢ Engineering Assistant (EA) at ID ➢ Agricultural Research and Productivity Assistant (ARPA) at ASC
Output	➢ Activity data of related FOs ➢ Material based on activity data for considering basic approach.
Work Procedure	(1) ***Formulation of questionnaire***: The study team formulates the survey questionnaire, and the working group could suggest improvements to its content. (2) ***Implementation of the survey***: The study team carries out the survey based on the questionnaire to target FOs. (3) ***Data collection and analysis***: The study team produces a data collection table and analyzes the data. (4) ***Sharing result of data analysis***: The study team shares the results of the data analysis with the working group.

Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Existing survey reports of FO	**FORMATS** ➢ Questionnaire referred by the result of "Study on Irrigation Management of FO" and "Field Survey of FO".

What are problems facing the FO?

As mentioned earlier in FO-01-02, there are several questions on problems faced. Apart from problems related to general management and activities, particular issues, or objectives of the survey, FOs can also simply identify other problems. In other words, basic information in FO-01-01 and activities in FO-01-02 can be a standardized questionnaire, but a questionnaire for problems faced may need to be specifically formulated.

One of the objectives of the JICA Study was to explore the condition of the Pre-Kanna meeting, Kanna meeting, PMC, and ASC. Moreover, the relationship between government agencies and FO, and land issue are other issues. Thus, the condition of the official meeting, the relationship between the agencies and the FOs, and land issues were explored in the Study.

Particular questionnaire format

As mentioned earlier, particular issues mentioned in the objectives of the survey are used to individually formulate the particular questionnaire format. The following questionnaire formats being formulated by the above three issues are discussed here as an example.

1) Condition of official meetings

The following questions should be asked to representatives of the FO:

Pre-Kanna meeting

1)-a: Do your representatives regularly attend it?

1)-b: Do you face any problems? (1: no proper action based on agreement, 2: improper agenda selection, 3: not problem solution oriented, 4: improper shared information, 5: others)

1)-c: Any suggestion?

Kanna meeting

1)-d: Do your representatives regularly attend it?

1)-e: Do you face any problems? (1: no proper action based on agreement, 2: improper agenda selection, 3: not problem solution oriented, 4: improper shared information, 5: others)

1)-f: Any suggestions?

PMC

1)-g: Do your representatives regularly attend it?

1)-h: Do you face any problems? (1: no proper action based on agreement, 2: improper agenda selection, 3: not problem solution oriented, 4: improper shared information, 5: others)

1)-i: Any suggestion?

Agrarian Services Committee

1)-j: Do your representatives regularly attend it?

1)-k: Do you face any problems? (1: no proper action based on agreement, 2: improper agenda selection, 3: not problem solution oriented, 4: improper shared information, 5: others)

1)-l: Any suggestion?

2) Condition of the relationship between the agencies and the FOs

The following questions should be asked to representatives of FO:

2)-a: What kind of services do you receive from the agencies? (from IMD, ID, ASCD, AD, DS)

2)-b: Do you face any problems?

2)-c: Any suggestion?

3) Land issue

The following questions should be asked to representatives of FO:

3)-a: What types of land title do you mainly have in your FO? (1: LDO permit, 2: Private ownership, 3: Swarnaboomi, 4: Jayaboomi, 5: Others)

3)-b: Do you have any problems related to land? (1: Land border issue, 2: Land fragmentation, 3: Illegal filling, 4: others)

Data collection format

The following formats are suggested.

Data collection format for official meeting

	Official Meetings											
	Pre=Kanna			Kanna			PMC			Agrarian S C		
Name	Y/N	Problem	Sugges.	Y/N	Problem	Sugges.	Y/N	Problem	Sugg	Y/N	Pro.	Sugg.
A FO	1/0	1-5		1/0	1-5		1/0	1-5		1/0	1-5	.
B FO												

Data collection format for the relationship

Name	Official Meetings														
	IMD			ID			ASCD			Agrarian S C			DS		
	Act.	Pro.	Sugg.	Act.	Pro	Sugg. .	Act.	Pro.	Sugg.	Act.	Pro	Sugg	Act.	Pro.	Sugg.
A FO															
B FO															

Data collection format for land issue

Name	Land Issue	
	Title	Problem
A FO	1-5	1-4

FURTHER INFORMATION
⇒ Final Report Chapter 3 Farmers' Organization (FO)
⇒ Annex-C Farmers' Organization
⇒ Project Management & Consultancy Services, May 2005, *Study on Irrigation Management of Farmer Organizations in Nachchaduwa Irrigation Scheme (*JICA, Colombo)

FO-02	Integrated Monitoring and Evaluation for Farmers' Organization
FO-02-01	Method of survey for integrated monitoring and evaluation of FOs
Purpose	➢ To formulate a format for data collection for integrated monitoring and evaluation of farmers' organizations.
Working Group/ Study Team	Working Group ➢ Resident Project Manager (RPM) at Irrigation Management Division (IMD) ➢ Institutional Development Officer (IDO) at IMD ➢ Development Assistance (DA) at IMD ➢ Irrigation Engineer (IE) at Irrigation Department (ID) ➢ Engineering Assistant (EA) at ID ➢ Assistance Government Agent (Divisional Secretary) ➢ Land Officer, Grama Niladhari (GN) ➢ Divisional Officer (DO) at Agrarian Service Centre (ASC) ➢ Agricultural Research and Productivity Assistant (ARPA) at ASC ➢ Agricultural Instructor (AI) ➢ Other related agencies ➢ Representatives of FO Study Team ➢ Resident Project Manager (RPM) at Irrigation Management Division (IMD) as a Team leader for Large Irrigation Scheme ➢ Institutional Development Officer (IDO) at IMD ➢ Development Assistance (DA) at IMD ➢ Irrigation Engineer (IE) at Irrigation Department (ID) as a Team Leader for Medium Irrigation Scheme ➢ Engineering Assistant (EA) at ID ➢ Agricultural Research and Productivity Assistant (ARPA) at ASC ➢ Representatives of FO
Output	➢ Data of Monitoring and Evaluation related to FOs ➢ Material based on the data for considering further plan and activities.
Work Procedure	(1) ***Formulation of integrated M & E questionnaire***: The study team formulates the questionnaire, and the working group may suggest improvements. (2) ***Implementation of the M & E***: The study team carries out the M & E based on the questionnaire to target FOs. (3) ***The M & E data collection and analysis***: The study team produces the format of the M & E data collection and analyzes the data. (4) ***Identifying problems and constraints:*** The study team identifies constraints and solutions for the problems analyzed by the data. (5) ***Formulating further action plan:*** The study team formulates an action plan with the working group in response to the problems. (6) ***Implementation of an action plan:*** FOs implement an action plan with the collaboration of related government agents

Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Existing M & E survey reports of FO	**FORMATS** ➢ The integrated M & E questionnaire refers to the results of the "Study on Irrigation Management of FO" and "Integrated Monthly Progress Report at Ag. SC".

What is integrated Monitoring and Evaluation for FO ?

Integrated Monitoring and Evaluation is a process of plan, implementation, M & E, and plan as shown in the following Figure:

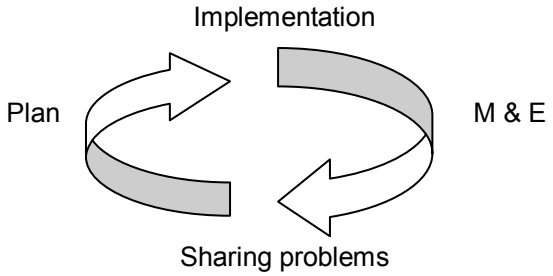


Figure: The process of integrated M & E

Monitoring and Evaluation leading to further action plans and its implementation for solving problems is essential to the integrated Monitoring and Evaluation. In other words, the objective of the integrated M & E is not to carry out the M & E, but to try to solve problems identified by the integrated M & E. Thus, the team leader has to be a conditioner to make a bridge between the problem and a solution.

Involvement of the process of integrated M & E is vital to build the capacity of FOs. There is a process of involvement in a participatory way arranged by the agencies so that the FO owns the decision, depending mainly upon the capacity of the FO. It is expected that the FO will ultimately be able to operate the process of integrated M & E with the cooperation of related agents in the field of the FO's activities and O & M of D and F-canals.

Organizational management requires discussion and decision-making among official bearers and FO members in meetings[1], financial management, and implementation of activities under the FO. The characteristic of management and activities can be changed from basic and simple to complicated and income generation oriented, depending mainly upon the level of organizational capacity. Thus, exploration of changing in terms of official meetings, financial management, and type of activities certainly contributes to an understanding of the level of the FO's capacity (more independent activities).

Plan

There are two types of plan, that is, a long-term plan, and a problem-solving oriented plan. The long-term plan is to achieve objectives over a long-time. The problem-solving plan is to solve present problems being faced. Problems identified by the integrated M & E can be grouped according to

[1]Most important issues are discussed and agreed in informal meetings. But it is almost impossible to explore the contents of informal meetings due to private conversation.

whether they are best addressed by a long-term plan or a problem-solving plan. It is also quite important to solve problems considering the objectives of the long-term plan instead of interfering with the objectives of the long-term plan by including present problems. For example, providing materials to the FO for solving present problems sometimes interferes with capacity building of the FO as a long-term objective.

M & E

It is quite important to carry out regular M & E in order to explore time-series of change in the FO. In this regard, the DO under Ag. SC has fortunately implemented an integrated monthly progress report. Related agents have to share the results of the report. It seems that there is a space to attach conditions of other activities such as water management, maintenance of canal facilities, and development activities. An additional integrated monthly progress report will then be proposed.

Sharing problems

Identifying problems by M & E is useless if there is no procedure to solve the problems. For the purpose, it is quite important to share problems among related agents and FOs.

The M & E questionnaire format to FO

The M & E questionnaire can be an additional integrated monthly progress report. There are three items in the E & M questionnaire format as follows:

1) Condition of official meeting
2) Condition of financial management
3) Condition of FO's activities

1) Condition of official meeting in last month

The following questions should be directed to representatives of the FO and FCG:

General meeting

1)-a: Do you hold general meetings?

1)-b: How many participants (male and female)?

1)-c: What are the agenda items? (1: administration including election, 2: water management, 3: O & M of canal facilities, 4: development activities, 5: others)

FO Committee meeting

1)-d: Do you hold committee meetings?

1)-e: How many participants (male and female)?

1)-f: What are the agenda items? (1: administration including election, 2: water management, 3: O & M of canal facilities, 4: development activities, 5: others)

FCG formal meeting

1)-g: Do you hold any formal FCG meetings?

1)-h: How many participants (male and female)?

1)-i: What are the agenda items? (1: administration including election, 2: water management, 3: O & M of canal facilities, 4: development activities, 5: others)

Any other official meeting

1)-j: Do you hold any other official meeting?

1)-k:How many participants (male and female)?

1)-l: What are the agenda items? (1: administration including election, 2: water management, 3: O & M of canal facilities, 4: development activities, 5: others)

2) Condition of financial management in last month

The following questions should be directed to representatives of FO

2)-a: How much income and expenditure?

2)-b: How much in cash and bank deposit?

3) Condition of activities in last month

The following questions should be directed to representatives of FO and FCG

FO and FCG

3)-a: What kind activities did you carry out? (1: administration, 2: water management, 3: O & M of canal facilities, 4: development activities, 5: others). If possible, which FCG?

3)-b: How many participants for each activity?

3)-c: If development activities, what kind activity? (1: micro credit, 2: group purchase, 3: group marketing (storage and selling), 4: welfare activities, 5: others)

With respect to micro credit programme, the difference between the programme arranged by Ag, SC and FO' own arrangement and fund has to be clearly distinguished to understand properly the level of FO capacity.

Data collection E & M format

The following formats are suggested.

Data collection format for official meeting

	Official Meetings under FO and FCG											
	General meeting			Committee meeting			FCG formal meeting			Other formal meeting		
Name	Y/N	partipa.	agenda	Y/N	partipa.	agenda	Y/N	partipa.	agenda	Y/N	partipa.	agenda
A FO	1/0	M (F)	1-5	1/0	M (F)	1-5	1/0	M (F)	1-5	1/0	M (F)	1-5
B FO												

Data collection format for financial management

Name	Financial Management			
	Income	Expenditure	Item	Remark
A FO	Last balance			in cash (bank)
	Final balance			in cash (bank)

Data collection format for FO activities

Name	Activities			
	Type	FCG	participatory	development
A FO	1-5		M (F)	1-5
B FO				

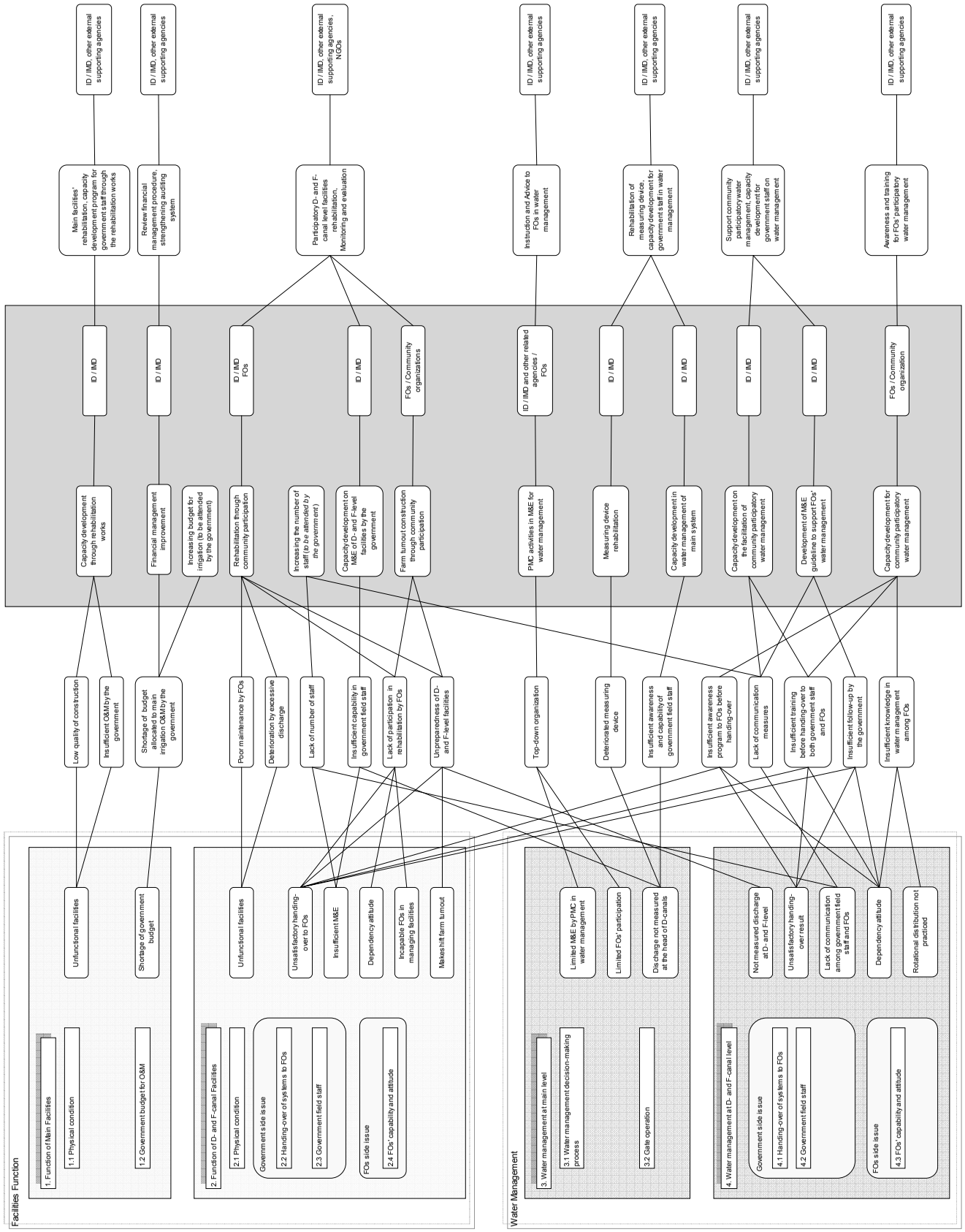
Chapter 7

AP-01	Formulation of Improvement Approach	
AP-01-01	Preparation of Approach to Improve Present Condition	
Purpose	➢ Identification of problems, issues to be categorized ➢ Analyzing causes corresponding to those categories ➢ Preparation of approach and associated activities	
Working Group	➢ Relevant government officials ➢ Relevant institutions ➢ Representative of Farmers' Organizations (FOs)	
Output	➢ Improvement Approach for each Sector	
Work Procedure	(1) ***Identification of Problems and Issues***: Based on the sectoral study in the preceding steps, the present conditions and related problems are tabulated. In order to prepare the approach, those problems and issues are categorized as subject-wise and/or scheme-wise. (2) ***Analyzing causes Corresponding to Problems***: Each problem has its own causes. To prepare an approach, analysis is undertaken to clarify the causes related to each problem. (3) ***Preparation of Approach***: Based on the causes clarified, an approach is prepared to mitigate those causes. A target group is also considered for each approach. In addition, activities associated with the approach are studied and listed along with its implementer.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Data collected in the preceding step of the study	**FORMATS** ➢ See figures in the next page

Sample of Approach

The relationship between problems, causes and approach are not straightforward. Rather, they have interlinkages. In order to explain this, a pictorial format is useful to facilitate the stakeholders' understanding. Some examples of problems, causes and approaches are illustrated as follows:

The figure shows the approach for the irrigation sector. Problems and issues are firstly categorized into four: (i) function of main facilities, (ii) function of D- and F-canal level facilities, (iii) water management at the main level, and (iv) water management at D- and F-canal level. Such categorization is made based on responsibilities among stakeholders. Then, causes and approaches are analyzed and prepared corresponding to problems and issues.



FURTHER INFORMATION

⇒ Final Report Chapter 5

Chapter 8

<table>
<tr><td>T-01</td><td colspan="2">Training Program</td></tr>
<tr><td>T-01-01</td><td colspan="2">Training Program Preparation</td></tr>
<tr><td>Purpose</td><td colspan="2">➢ To review the present training programs in the relevant institute
➢ To identify necessary training areas to support proposed improvement approach</td></tr>
<tr><td>Working Group</td><td colspan="2">➢ Irrigation Training Institute (ITI), Galgamua
➢ In-service Training Centre (ISTC)
➢ Field Crop Research Institute (FCRI)
➢ Regional Director of Irrigation (RDI) Office
➢ Institute of Post Harvest Technology (IPHT)
➢ Representative of Farmers' Organizations (FOs)</td></tr>
<tr><td>Output</td><td colspan="2">➢ Training programs and their contents</td></tr>
<tr><td>Work Procedure</td><td colspan="2">(1) Review of proposed approach: The improvement approach together with activities (projects) is prepared in the preceding steps. In this stage, these are reviewed and necessary training corresponding to supporting those activities is considered. The following activities and information would be useful in this step: (i) interviews with field staff and FOs, (ii) questionnaire to find out constraints, (iii) personnel records, if any, (iv) training records, existing training approach and module as well as assessment of prior learning kept at relevant institution.
 
Site Workshop and Training Examination
By gathering the government field staff and the representative of FOs so as to finalize proposed training
(2) Workshop Organization: A site workshop is carried out to confirm opinions from stakeholders consisting of the government field staff (IE, EA, WS and WIL) and FOs (representative and member farmers). Training trial and examination is also useful for confirmation of the effectiveness of rectification measures.</td></tr>
<tr><td>Necessary Materials and Sample Formats</td><td>NECESSARY MATERIALS
➢ Improvement approach (problem – cause – approach analysis flow)</td><td>FORMATS
➢ See sample in the next page</td></tr>
</table>

Sample of Training Program Contents proposed under the JICA Study

Training program contents—which are divided into two categories by the target groups of government officials and FOs—are prepared for each sector based on present situation analysis, problem and constraints identification, and improvement approach formulation. Some are categorized as common to the whole sector. Such training areas are listed below to support improvement approach.

List of Training Course Proposed for Integrated Management in Irrigation Sector

Sector & Category	Farmers' Organization	Government Officials
Common		
Common		– Training of Trainers (TOT) Programme for Training (planning, training methodology, execution, monitoring & evaluation)
Basic Management Approach	– Awareness Programme of FO & FCG – Institutional Strengthening of FO & FCG – Financial Management of FO & FCG	– (TOT for Awareness) – (TOT for Institutional Strengthening) – (TOT for Financial Management)
Strengthening Social Capital Approach	– (Particular Programmes in each activity associated with Awareness Programme) – (Self-Monitoring Programme)	– (Particular Programme in each activity) – (Follow-up and Monitoring & Evaluation)
Irrigation		
Function of Main Facilities	– (Awareness Programme)	– Irrigation Rehabilitation – Financial Management for Irrigation
Function of D- and F-canal Facilities	– Community Participatory Approach in Irrigation Rehabilitation	– Community Participatory Approach Facilitation in Irrigation Rehabilitation
Water Management at Main Facilities	– Organizational Management for PMC – (Awareness Programme for Water Management on Main Level Facilities)	– Organizational Management for PMC – Water Management on Main Level Facilities
Water Management at D- and F-canal level	– Community Participatory Water Management	– Community Participatory Water Management Facilitation
Agriculture		
Common in Agriculture	– (Awareness Programme, Self Monitoring)	– (Facilitation, Transfer of Technology, Follow-up and Progress Monitoring)
Paddy Production	– Procurement of Credit, Inputs & Machinery – Tract Demonstration of Paddy Cultivation – Seed Paddy Production – Quality Improvement of Paddy – Farm Mechanization	– (TOT for Procurement and Bulk Purchase) – (TOT for Subjects in Tract Demonstration) – (TOT for Seed Paddy Production) – (TOT for Post Harvest Technology) – Field Adaptability of Farm Machinery
OFC, Fruits & Vegetable Production	– Awareness and Adaptation Programme of Crop Diversification	– (TOT for Awareness and Subjects on Crop Diversification)
Other Farm Income	– Awareness Programme	– (TOT for Facilitation)
Marketing & Processing		
Marketing & Processing of Paddy	– Facilitation of Money Saving – Operation and Maintenance of Warehouse – Open Paddy Market (OPM), Operation & Management	– (TOT for Facilitation of Money Saving) – Operation and Maintenance of Warehouse – Open Paddy Market, Operation & Management
Marketing & Processing of OFC, Vegetables & Fruits	– (Dissemination of Zoning Policy) – Market Information System & Dissemination – Minimization of Post-Harvest Loss – Group Activity – Management of Economic Center (Thambuttegama Wholesale Market)	– Zoning Policy for Vegetable and Fruits – (TOT for Market Information System & Dissemination) – (TOT for Post-Harvest Loss) – (TOT for Group Activity) – Management of Economic Center (Thambuttegama Wholesale Market)
Other Income Generation	– Value addition and food processing	– (TOT for Value addition and food processing)

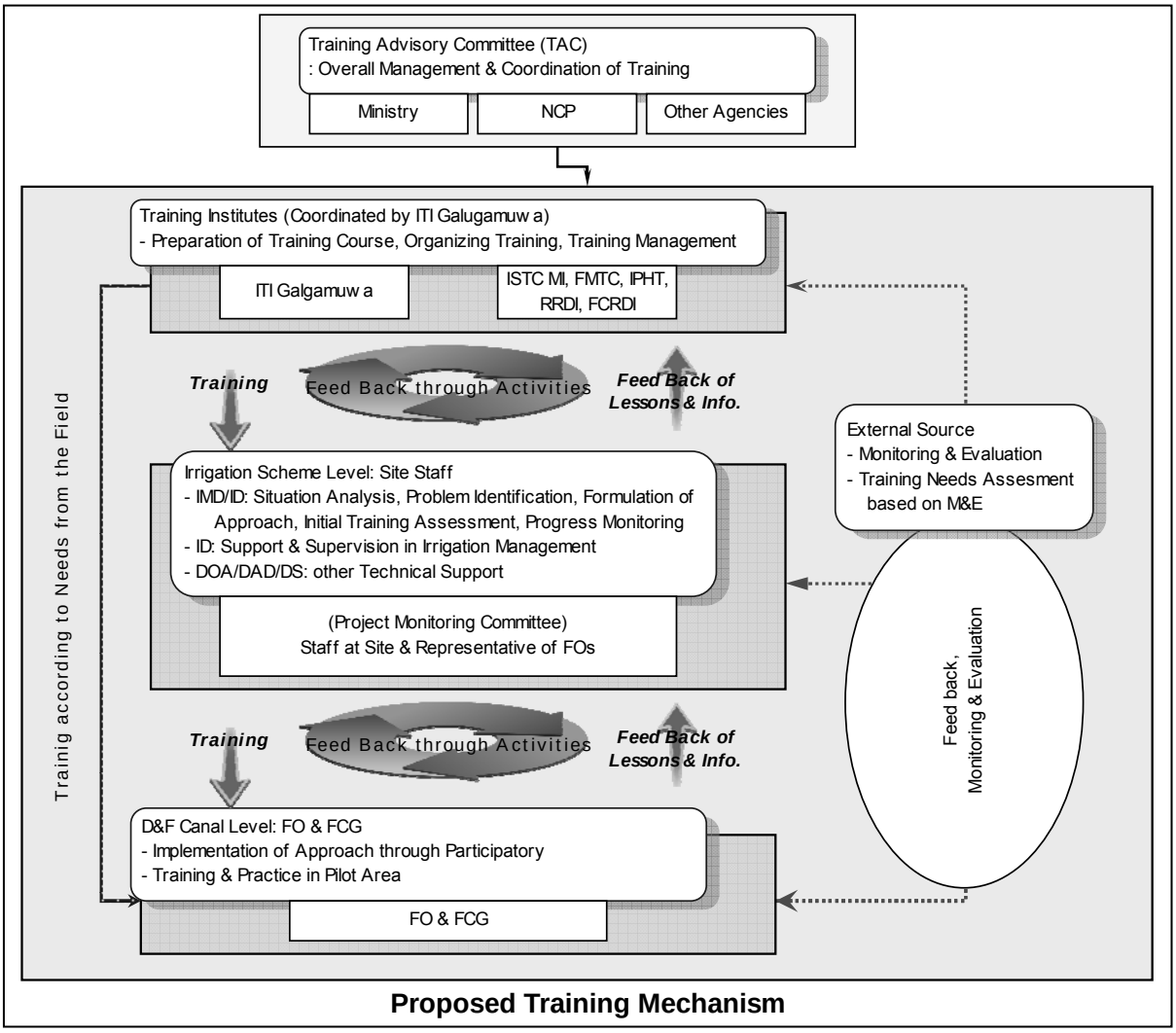
FURTHER INFORMATION

⇒ Draft Final Report Chapter 4 (Improvement approach analysis flow)
⇒ Draft Final Report Chapter 5 (Training areas and those contents)

T-01	Training Program	
T-01-02	Training Program Implementation Mechanism	
Purpose	➢ To identify related-agencies for the implementation of proposed training programs ➢ Preparation of proposed training program implementation mechanism	
Working Group	➢ Irrigation Training Institute (ITI), Galgamua ➢ In-service Training Centre (ISTC) ➢ Field Crop Research Institute (FCRI) ➢ Regional Director of Irrigation (RDI) Office ➢ Institute of Post Harvest Technology (IPHT) ➢ Representative of Farmers' Organizations (FOs)	
Output	➢ Training program implementation mechanism (flow and reports)	
Work Procedure	(1) ***Identification of relevant agency***: The relevant agency to provide the proposed training program is investigated. The work includes (i) inventory of training institute, (ii) collection and analysis of existing training programs (syllabus) in candidate institutes. (2) ***Workshop Organization***: If necessary, a workshop is organized by gathering officers who would be involved in the implementation of the prospective training program. The workshop agenda generally consists of: (i) improvement approach for each sector (irrigation, agriculture, marketing and so forth), (ii) training list to support improvement approach, and (iii) training implementation mechanism. The workshop is to confirm and find out the function of the relevant institutes, any constraints, and to revise the implementation mechanism accordingly.	
Necessary Materials and Sample Formats	**NECESSARY MATERIALS** ➢ Training syllabus	**FORMATS** ➢ See sample in the next page

Sample of Training Implementation Mechanism proposed under the JICA Study

The training implementation mechanism prepared under the JICA Study is illustrated below. Various organizations are related to the mechanism. Overall management is carried out by the Training Advisory Committee (TAC) consisting of Ministry, NCP and other agencies. ITI Galgamwa would be a coordinating hub for implementation. Training is implemented at the irrigation scheme level as well as the D&F canal level like a cascading system with feed-back, monitoring and evaluation.



Proposed Training Mechanism

The principle of training mechanism is a needs-based approach. The program is carried out from needs assessment followed by objective setting, training design, training implementation and monitoring and evaluation (M&E). The feedback of lessons and information is emphasized through field-based activities to suit the actual needs. Although this mechanism is shown at the comparatively large national-level, the principles would be the same when the training is carried out at the micro-level. What are your resources for training implementation?

Tips

(1) Evaluation is to assess the effectiveness of the training program. Through this, you will have the chance to put right some of the problems inherent in the original proposed training.

(2) Field-based exercises are important within training mechanism. Why? One should not lose the fact that training is only useful if the knowledge and skills to be taught are transferred to the field.

FURTHER INFORMATION

⇒ Draft Final Report Chapter 5

Figure

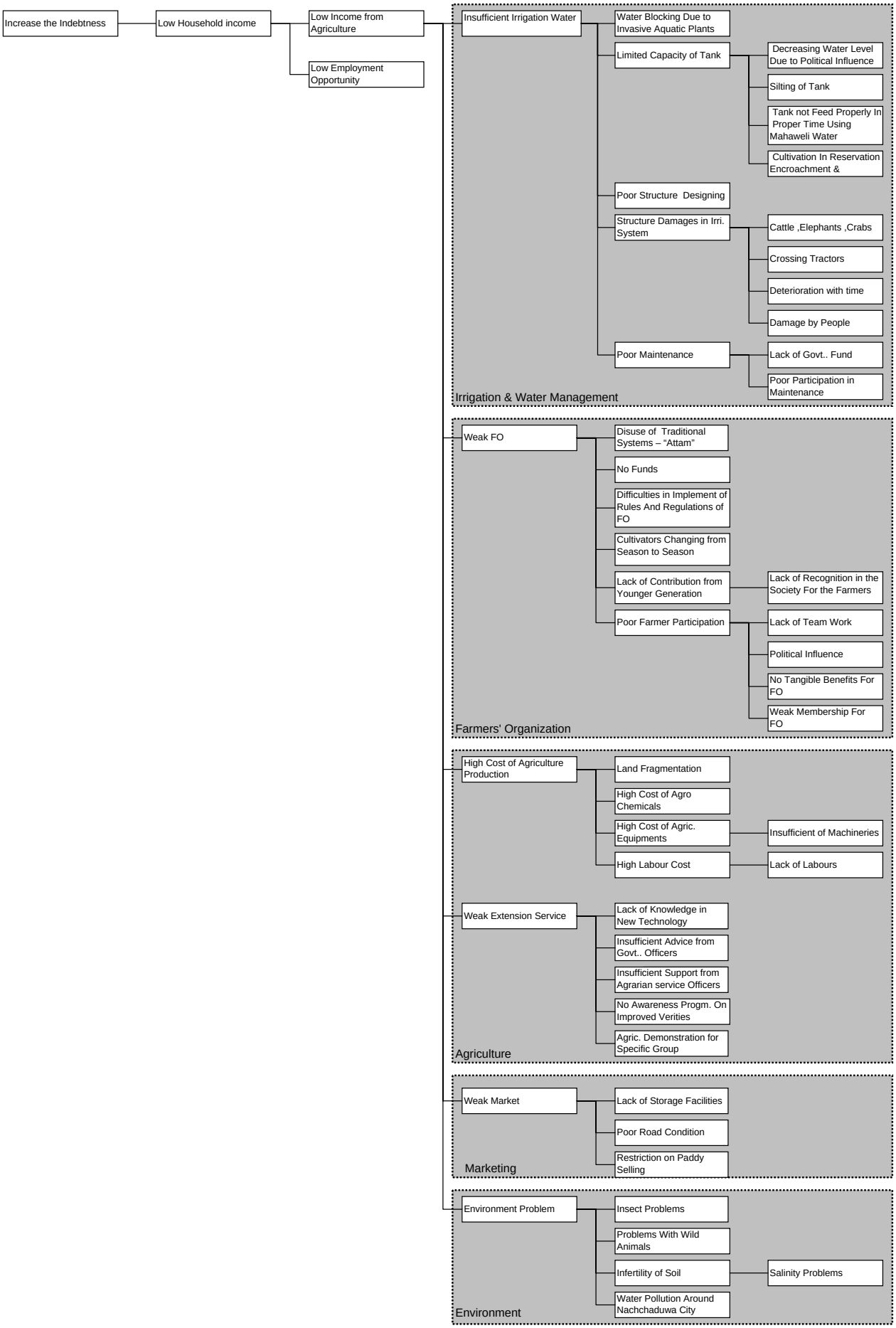


Figure-1 Sample of Problem Tree

"Problem Tree" prepared by "Isuru" and "Mahanama" Farmer Organizations of Nachchaduwa and Turuwila Irrigation Schemes

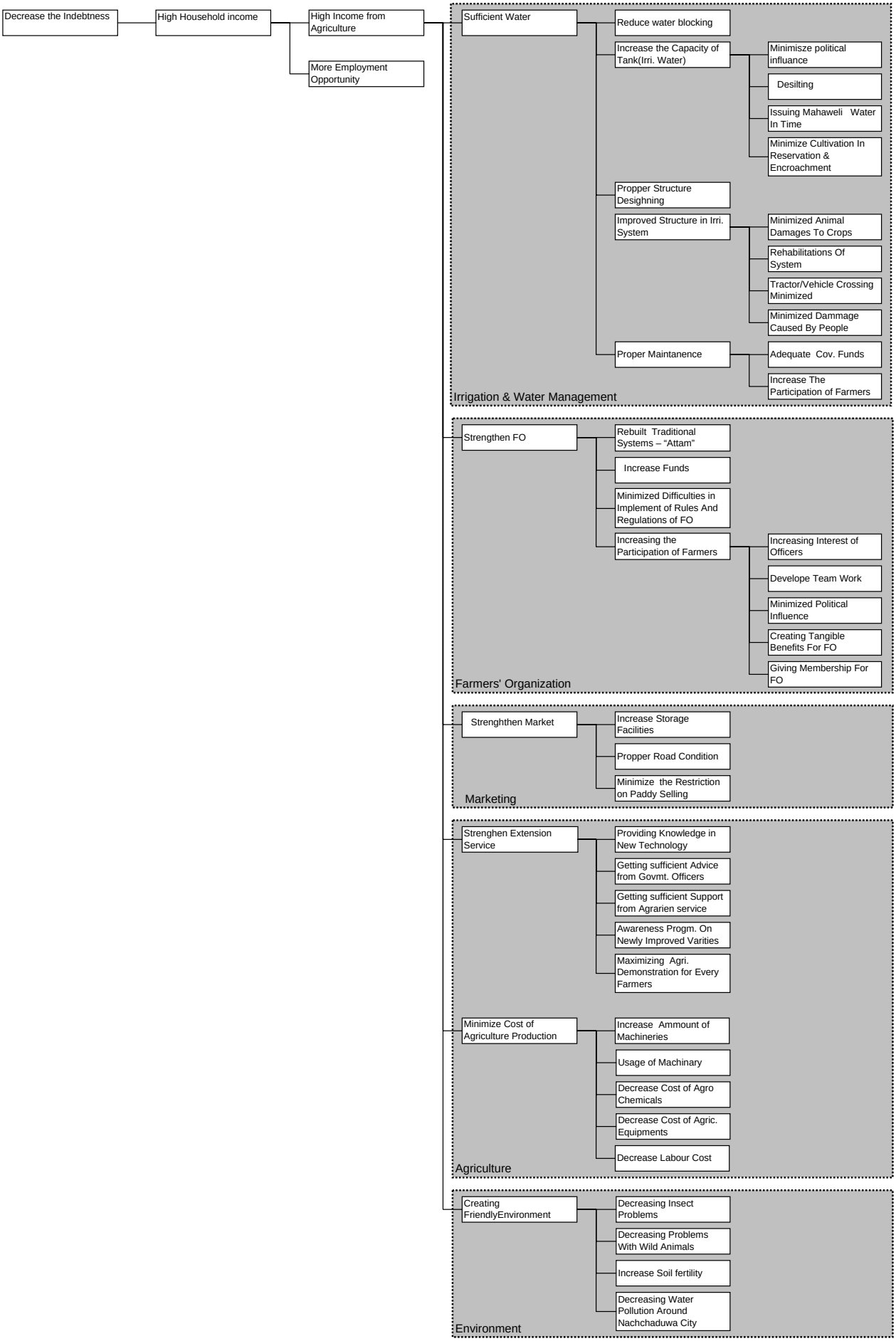


Figure-2 Sample of Objective Tree

"Objective Tree" prepared by "Isuru" and "Mahanama" Farmer Organizations of Nachchaduwa and Turuwila Irrigation Schemes

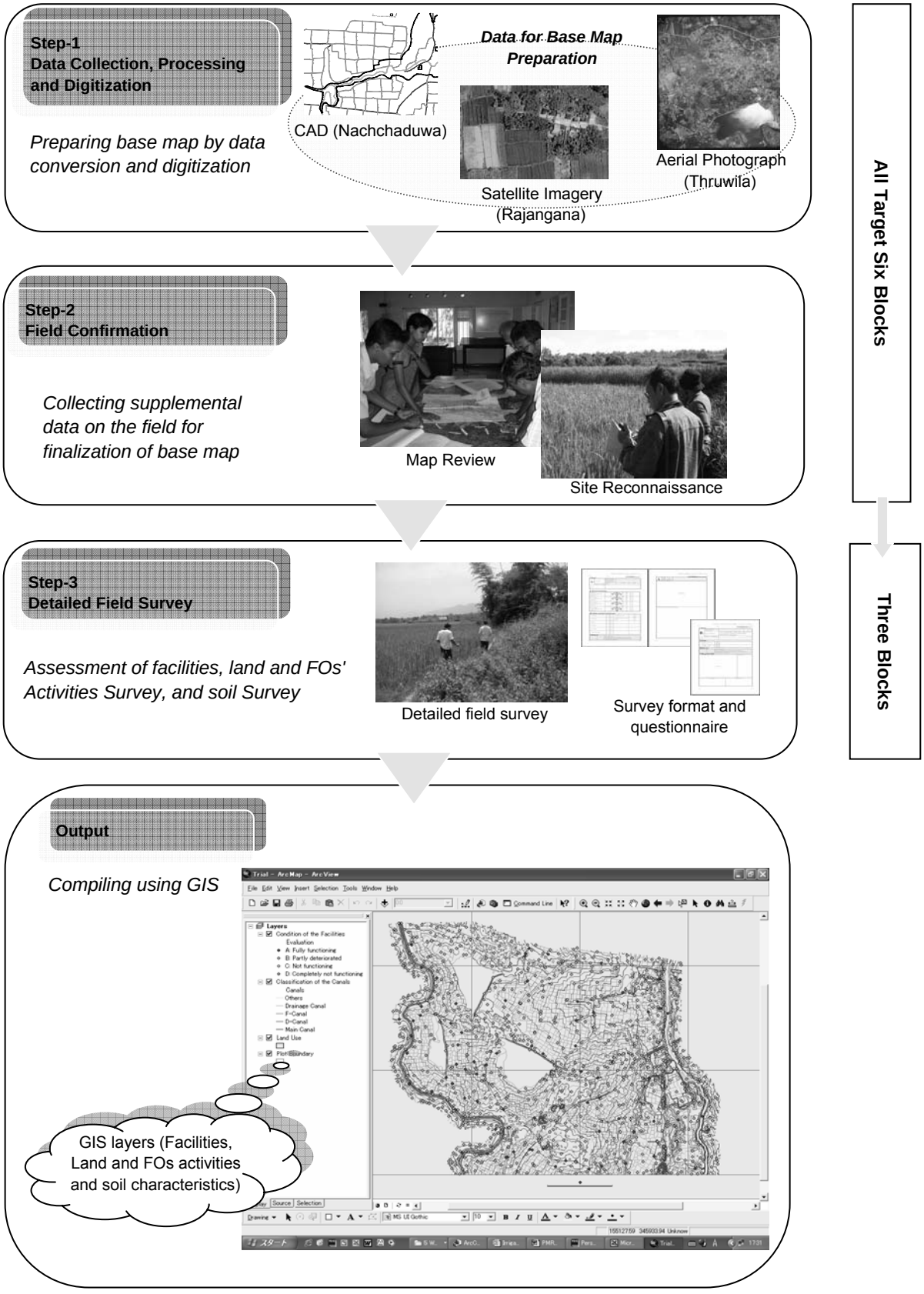


Figure-3 General Work Procedure for the Preparation of GIS-based Irrigation Block Mapping

Form

Project Design Matrix

Name of Project .....
Project Area ..... Duration ..... Date .....
Executing Agency ..... Target Group .....

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal	1.1	1.1	●
1.1			
1.2	1.2	1.2	
Project Purpose			●
2.1	2.1	2.1	
Outputs	3.1.1	3.1.1	●
3.1			
	3.1.2	3.1.2	●
3.2	3.2	3.2	●
3.2.1	3.2.1	3.2.1	
			●
3.2.2	3.2.2	3.2.2	
			●
3.2.3	3.2.3	3.2.3	
3.3	3.3	3.3	
3.3.1	3.3.1	3.3.1	
3.3.2	3.3.2	3.3.2	
		3.3.3	
3.3.3	3.3.3		
	3.3.3	3.3.3	
3.3.4	3.3.4	3.3.4	
3.3.5	3.3.5	3.3.5	
Activities	**Inputs**		●
4.1	Foreign Donor	Sri Lankan Side	●
4.1.1	●	(1)	
4.1.2	●	●	●
4.1.3	●	-	
4.2	-	-	**Pre-conditions**
4.2.1	-	-	●
4.2.2	-	●	
4.2.3	●	●	
4.3	-		
4.3.1		(2)	●
4.3.2	-	●	
4.3.3	●		●
4.3.4	●	(3)	
4.3.5	●		

FORM-1

Plan of Operations

Name of Scheme: .....

Activities	Expected Results	Schedule (Year)								Agencies in Charge	Inputs	Remarks
		1st	2nd	3rd	4th	5th	6th	7th	8th			
1.												
2.												
3.												
3.1												
(1)												
(2)												
3.2												
(1)												
3.3												
(1)												
(2)												
3.4												
(1)												
(2)												
(3)												
4.												
4.1												
4.2												
4.3												
5.												

FORM-2

DRAFT TECHNICAL SPECIFICATIONS
FOR
WATER QUALITY SURVEY
ON
INCREASING THE CAPACITY OF INTEGRATED MANAGEMENT
IN
IRRIGATION SECTOR
IN
SRI LANKA

1. GENERAL

1.1 Objective of the Work

Objective of the Work is to examine the impact of farming practice to the source water such as effluent of fertilizers causing contamination in downstream water. The quality shall be analyzed from the viewpoints of irrigation and drinking water use.

1.2 Study Area

The study area is Nachchaduwa, Rajangana and medium irrigation schemes in Anuradhapura District. Sampling sites will be selected by the Study Team from the viewpoint of irrigation water use; inflow to the tank, convey canals, and return flow to the river water.

1.3. Scope of the Work

The Contractor shall carry out the Works as specified below:

(1) The Contractor shall propose and submit to the Study Team the schedule and procedure before the commencement of the Work. The plan is necessary to be approved by the Study Team.

(2) The Contractor shall carry out water quality analysis of 84 water samples (28 sites x 3 times). The parameters of analysis of water, method of water analyses and quantities of the Works are described in sections 2 and the Attachment.

(3) The Contractor shall submit the Study Team the reports including all the results of laboratory analysis according to the formats and specifications given by the Study Team.

2. METHODOLOGY OF THE WORK

2.1 Sampling Sites and Frequency

Samples for the water quality analysis will be taken from the river, canals and existing wells. Number of the sampling sites is 16 for irrigation water and 12 for

drinking water and it will be conducted three times as described in the Attachment. The exact location of sampling sites will be indicated by the Study Team.

2.2 Parameters of Water Quality Analysis

The parameters to be analyzed in the water quality analysis and quantities are shown in the Attachment.

2.3 Methods of Water Quality Analysis

Methods of analysis for each parameter shall be selected in accordance with the standard methods adopted by the Government of Sri Lanka. It should be approved by the Study Team before the commencement of the Work.

3. OUTPUTS

The Contractor shall submit the following reports in hardcopy and digital form to the Study Team.

i)	Laboratory test results of Water Quality Analysis	5 copies
ii)	Explanatory report on water analysis results	5 copies

(description on sampling sites and sampling method, situation of sampling with photograph, laboratory testing analysis method with copy of test manual, result of analysis and discussion)

4. WORK SCHEDULE

All the works shall be completed by the first week of March 2006. The Contractor shall follow the plan and schedule approved by the Study Team.

5. SUPERVISION OF THE SURVEY

The Study Team has the right to supervise the Work and to approve the plan of operation, work methods and progress of the Work. The Study Team also has the right to accept and reject the result of the Work. Usual and emergency contact address of the Contractor shall be reported to the Study Team before commencement of the Work.

FORM-3 (3/3)

Number of Sampling Sites:

Scheme	Irrigation Water	Drinking Water
Rajangana	0	6
Nachchduwa	12	4
Thuruwila	4	2
Total	16	12

Sampling frequency:

Month	Dec-05				Jan-06				Feb-06				Mar-06	
Week	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	
Sampling		+				+				+				
Report													+	

Proposed parameters:

Parameter	Abbr.	Unit	Irrigation	Drinking	Method
Temperature			+	+	DO meter
Diss. Oxygen	DO	mg l^{-1}	+		DO meter
Conductivity	EC	µS cm^{-1}	+	+	EC meter
Total Sus. Solids*	TSS	mg l-1		+	Gravimetry
pH	pH		+	+	pH meter
Alkalinity	Alk	mg l-1	+	+	APHA
Turbidity	Turb.	NTU		+	Titrimetry
Sodium	Na	mg l-1	+	+	AAS
Calcium	Ca	mg l-1	+	+	AAS
Magnesium	Mg	mg l-1	+	+	AAS
Potassium	K	mg l-1	+	+	AAS
Chloride	Cl^-	mg l-1	+	+	APHA
Sulphate	SO_4^{2-}	mg l-1	+	+	APHA
Hardness*	Hd	mg l-1		+	APHA
Total Solids	TDS	mg l-1	+	+	Calculation
Fluoride*	F^-			+	Colorimetry
Nitrate*	NO_3^-	µg l^{-1}	+	+	APHA
Nitrite	NO_2^-	µg l^{-1}	+	+	APHA
Ammonium	NH_4^+	mg l-1	+	+	
Total Phosphate*	PO_4^{3-}	µg l^{-1}	+	+	APHA
Disolved Phosphate	PO_4^{3-}	µg l^{-1}	+	+	APHA
Total Iron	Fe	mg l^{-1}		+	AAS
Manganese	Mn			+	AAS
Copper	Cu	µg l^{-1}	+	+	AAS
Zinc	Zn	µg l^{-1}	+	+	AAS
Boron*	B	µg l^{-1}	+		AAS
Sodium Absorption Ratio*	SAR	meq l^{-1}	+		Calculation
BOD_5	BOD_5	mg l^{-1}	+	+	
COD_5	COD_5	mg l^{-1}	+	+	
No of parameters			23	26	

FORM-4

Outline of Soil Survey Report

1. Introduction

Purpose of the survey and general methodology (see box for some example of soil survey item), schedule and team organization, limitations of soil survey (if any)

Box: Some example of soil survey items:
Items should meet the different requirement, however, general items contained in the soil survey are:

- Alkalinity / Acidity	- Permeability
- Available water capacity	- Horizon thickness
- Depth to bedrock	- Salinity and/or sodicity
- Degree of erosion	- Slope gradient
- Depth to water table	- Soil color
- Soil lime (carbonates)	- Soil organic matter
- Soil structure	- Soil texture
- Stoniness	

2. Soil maps and mapping units

General specification of the maps is explained. The classification of the area, delineations, on a soil map represent combinations of soil series that occur in predictable patterns on the basis of landscape. Such predictable combinations are soil map units and are defined by a unique name and symbols.

**soil mapping units*

3. Soil characteristics and Findings related with land use and water management, irrigation and drainage

(1) Soil characteristics

(2) Irrigation and drainage and water management

(3) Fertility levels

General soil maps: *A general soil map which gives a broad picture of the type and distribution of soils that occur in the area.*

Interpretation should be elaborated based on the survey results, referring to behavior and response of soils related to human activities including irrigation and drainage, irrigation water management, fertility level.

4. Land use

Soil survey result lead to future land use to be explained in this chapter. Common interpretations are (i) land use capability classification, (ii) wind and water erodibililty classification and thereby judging future (iii) proposed land use.

**land suitability units*

5. Recommendations

Future plan on soil survey such as soil monitoring plan

Preliminary cost and schedule for such proposed plan

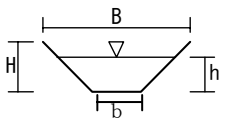
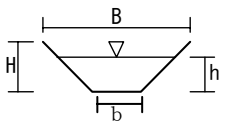
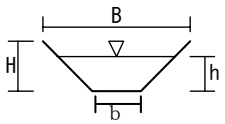
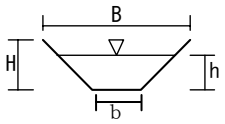
Institutional linkage necessary to materialize propose plan

Facilities' Assessment (Canals) Serial Number : A-

I. General

A-1	Location	Map Coordinate	
		Name of Canal	
		Purpose	Irrigation / Drain / Others
	Date of visit (member)		
Access		Good Moderate Bad	

II. Dimension and Conditions

Upstream Canal dimensions and conditions	Canal name		B: (m) H: (m) h: (m) b: (m)	Concrete Lined Earth
Downstream-1 Canal dimensions and conditions	Canal name		B: (m) H: (m) h: (m) b: (m)	Concrete Lined Earth
Downstream-2 Canal dimensions and conditions	Canal name		B: (m) H: (m) h: (m) b: (m)	Concrete Lined Earth
Downstream-3 Canal dimensions and conditions	Canal name		B: (m) H: (m) h: (m) b: (m)	Concrete Lined Earth

III. Problems on the Canal and the Structure

1. Sediments	none some serious	7. Canal road	good moderate bad none
2. Vegetation	none some serious	8. Others (specify below, if any)	none some serious
3. Erosion	none some serious		
4. Leakage	none some serious		
5. Overflow	none some serious		
6. Illegal checking	none some serious		

IV. Evaluation

A	Fully functioning
B	Partly deteriorated, but functioning in a satisfactory range
C	Not functioning well and/or affecting the downstream flow
D	Completely not functioning

Serial Number : A-

A-2	Canal	
	Number of Photo	
	Map Coordinate	

photograph

Sketch with direction of the photograph

Facilities' Assessment (Structures) Serial Number : B1-____

I. General

B-1	Map Coordinate	
	Canal Name	
	Type of Structure	Turnout / Duckbill Weir / Diagonal Weir / Drop / Spillway / Culvert / Field Inlet (Concrete) / Field Inlet (PVC) / Others (Specify) _____
	Date of visit (member)	
Access		Good Moderate Bad

II. Problems (II, III and IV is not required for PVC Field Inlet)

1. Structure Condition	none some serious	
2. Others (such as measuring device)	none some serious	

III. Evaluation

A	Fully functioning
B	Partly deteriorated, but functioning in a satisfactory range
C	Not functioning well and/or affecting the downstream flow
D	Completely not functioning

IV. Photograph & Sketch

Photograph	Comment

Serial Number : B1-_____

Structure Assessment (Details)

Scheme:	Nachchaduwa Rajangana Thruwila
Canal Name:	
Type of Structure	Turnout / Duckbill Weir / Diagonal Weir / Drop / Spillway / Culvert / Field Inlet (Concrete) / Field Inlet (PVC) / Others (Specify) _____
Date of visit (member)	

Assessment Point

1. Gate is available or missing?
2. Is it difficult to operate (open or close)?
3. Gate is seriously corroded?
4. Are there any cracks in any part of the structure?
5. Any leakage from the structure is found?
6. Downstream apron is scoured or damaged?
7. Measuring device is available or missing?

No	Item	Condition				Not Applicable
		Good			Serious	
1	Gate	A	B	C	D	NA
2	Operation	A	B	C	D	NA
3	Corrosion	A	B	C	D	NA
4	Cracks	A	B	C	D	NA
5	Leakage	A	B	C	D	NA
6	Downstream Damage	A	B	C	D	NA
7	Measuring Device	A	B	C	D	NA

A: None, it is in good condition

B: Partly, but not so serious

C: Not functioning well

D: Seriously damaged and structure is completely not functioning

NA: Not Applicable

Land and FOs' Activities Assessment

Scheme.: **Rajangana / Nachchaduwa / Thruwila**

Tract No/FO.:

Canal No.:

Date of visit (member)

Allotment No.	Farm Lot No. (ID)	1. Land Ownership													2. Land Use									3. FO Activity					
		Title Deed						Allocated under LO							2-1 Yala				2-2 Maha					3-1 Membership		3-2 O&M Fee		3-3 Attendance to Shramadana (FO activity)	
		Original	Descendant		Tenant	Lease	Thattu-Maru	Original	Descendant		Tenant	Lease	Thattu-Maru	No. of Operator Index	Paddy	OFC	Banana	Others	Paddy	OFC	Banana	Others		Yes	No	Yes	No	Yes	No
			Registered	Not Registrere					Registered	Not Registrere																			

FORM-7

Name of person in charge:

Signature:

FORM-8

Discharge Measurement and Calculation

Date:

Canal:

Measurement Point										
	Water depth (m)									
	Vertical point from water surface									
Staff Gauge Reading at BP										
	Measurement 1									
	Dial number (1, 5, 10, 20, 50 or 100) =(a1)									
	Number of Buzzer (=b1)									
	Time (sec) (=c1)									
	velocity (m/sec) (=v1=0.086 x N (a1 x b1)/c1) +0.019)									
	Measurement 2									
	Dial number (1, 5, 10, 20, 50 or 100) =(a2)									
	Number of Buzzer (=b2)									
	Time (sec) (=c2)									
	Velocity (m/sec) (=v2=0.086 x N (a2 x b2)/c2) +0.019)									
Average velocity (m/sec) (=1=(v1+v2)/2)										
	Canal base width (m) (=b)									
	Water surface width (m) (=B)									
Area of Cross-section (m2) (=2=((b+B)xD)/2)										
Discharge (m3/sec) (=3=1x2)										

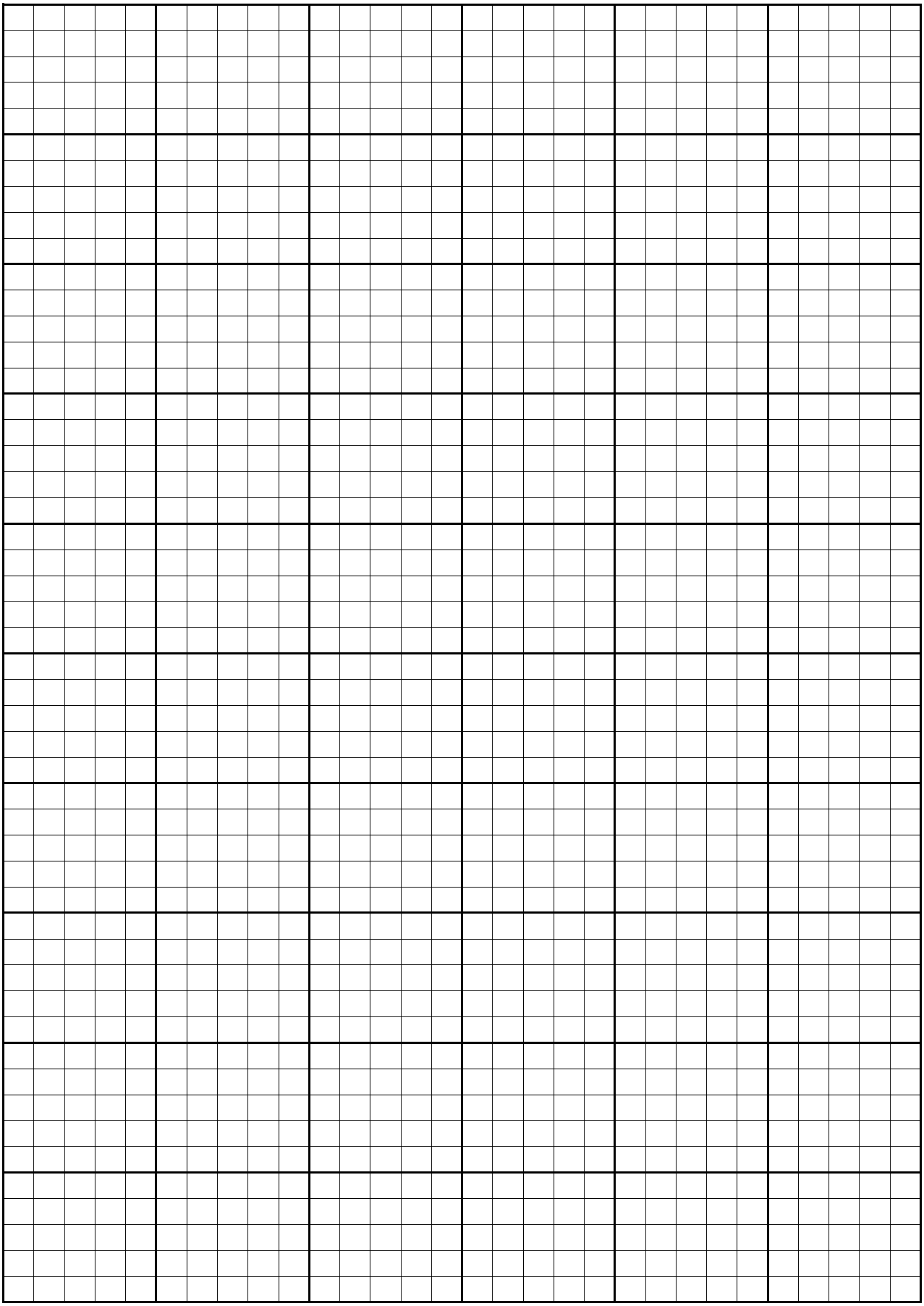
Current meter: Sanei-3,No. 6137
velocity = 0.086 N + 0.019
N = (dial number) x (number of buzzer) / (time)
(Applicable range: 0.120 m/sec - 1.997 m/sec)

Name of person in charge:

Signature:

Plotting Sheet for H-Q Curve Preparation

FORM-9



FORM-10

Daily Discharge to D-Canal

Scheme: Rajangana

Tract: LB Tract 2

Canal: D-1
Pilot Area

Date	Time	H (cm)	Remarks

Name of person in charge:

Signature:

Note:

1 Readings are to be taken at beginning point (BP) of D-canal once a day at 9:30 in th

2 In the remarks column, any occurances such as gate closure, deviation from issue scl misappropriation attempts are recorded.

FORM-11

Daily Discharge to D-Canal

Scheme: Rajangana

Tract: LB Tract 2

Canal: D-2 Control Area

Date	Time	H1 (cm)	H2 (cm)	Remarks

Name of person in charge:

Signature:

Note:

1 Readings are to be taken at beginning point (BP) of D-canal once a day at 9:30 in the morning.
2 H1 is measured at the concrete weir (overflow depth) while H2 is at the staff gauge.
3 In the remarks column, any occurances such as gate closure, deviation from issue schedule, misappropriation attempts are recorded.

Daily Discharge to F-Canal

Scheme: Rajangana

Tract: LB Tract 2

Canal: D-1
Pilot Area

Date:

FC No.	Time	Baffle Setting	Water Level	Duckbill / Diagonal Weir Spilling Over	Remarks
FC_7		15 / 10 / 5	Yes / No	Yes / No	
FC_8		15 / 10 / 5	Yes / No	Yes / No	
FC_9		30 / 15 / 10 / 5	Yes / No	Yes / No	
FC_10		15 / 10 / 5	Yes / No	Yes / No	
FC_12A		15 / 10 / 5	Yes / No	Yes / No	
FC_12		15 / 10 / 5	Yes / No	Yes / No	
FC_13		15 / 10 / 5	NA	NA	
FC_13A		15 / 10 / 5	NA	NA	
FC_14		15 / 10 / 5	NA	NA	

Name of person in charge:

Signature:

Note:

1 Readings are to be taken once a day in the morning between 9:30 and 10:30.
2 Water level is judged by checking the level at the horizontal bar attached on the buffle gate (see right). If the water level is almost same as that of bar, mark "yes". If the level is lower, mark "no".
3 If the water is spilling over appurtenant duckbill or diagonal weir, select "yes."
4 In the remarks column, any occurances such as gate closure, deviation from issue schedule, misappropriation attempts are recorded.

2. Water level measurement bar
- How to check water level

FORM-12

Daily Discharge to F-Canal

Scheme: Rajangana

Tract: LB Tract 2

Canal: D-2
Control Area

Date:

FC No.	Time	Gate	Water Level (cm)	Remarks
FC_21		Open / Close	Not measurable	
FC_21A		Open / Close		
FC_22		Open / Close	Not measurable	
FC_23		Open / Close		
FC_29		Open / Close		
FC_30		Open / Close	Not measurable	
FC_31		Open / Close		
FC_32		Open / Close		
FC_34		Open / Close		
FC_36		Open / Close	Not measurable	
FC_37		Open / Close	Not measurable	
FC_38		Open / Close	Not measurable	
FC_39		Open / Close	Not measurable	
FC_40		Open / Close		to be measured using Cut Throat Flume
FC_41		Open / Close	Not measurable	
FC_42		Open / Close	Not measurable	

Name of person in charge:

Signature:

Note:
1 Readings are to be taken once a day in the morning between 9:30 and 10:30.
2 Water level is measured by staff gauge attached on the beginning point of each FC.
3 Under the remarks column, any occurances such as gate closure, deviation from issue schedule, misappropriation attempts are recorded.

FORM-13

AG-01 SOCIO-ECONOMIC ASSESSMENT
AG01-01-01 Socio-economic Survey

Annexture 1 Sample Questionnaire

FARM ECONOMIC SURVEY

QUESTI0NNIARE

1 Name of farmer/operator _____ Main Canal _____

Address _____ D Canal _____

Name of Farmer Organization _____ F Canal _____

2 Household

Occupant	No.	Labour Contribution
Farmer/Operator		
Wife		
Children Infant/school going		
Dependent adult		
Independent		
Other dependents		

3 Farm Assets
Land Ownership

What was the original extent of farm holding ? (Ac / ha) Irrigated
Homestead

What is your relationship with the original holder ?

How many share holders are there for the land ?

How many operators are there in the block ?

Do you give part of your crop to non-operating share holders ?

If yes, what is the share ?

If no line ownership, what is your status as as operator ?

Tenant	Lessee	Thattumaru			

3.1 Farm Holding (Ac. or Ha.)

Irrigated					Home-stead	Other
Own	Tenant	Leased In	Leased Out			

3.2 House

Rooms	Roof	Walls	Floor	Toilet	Electricity	Water

3.3 Farm Machinery & Equipment (Nos.)

4W tractor	2W tractor	Thresher	Sprayer	W. pump	Trailer	

3.4 Home Appliances (Nos.)

TV	Radio	Phone	Sew Mach		

3.5 Transport (Nos)

Car/van	Truck	Mobike	Pushbike		

3.6 Processing Machimery

	Rice mill	Food Processing: DESCRIBE	Other
Capacity			

3.7 Farm Buildings

	Paddy Storage	Food Processing	Other (specify)
Capacity			

3.8 Livestock

Buffalo	Cattle	Poultry	Goat	Pig		

4 Homegarden

Perennials	No. of Trees	Production		Unit price Rs.	Qty Sold
		Unit	Qty		
Coconut					
Banana					
Mango					
Drumstick					
Jak					
Teak					
Neem					
Other Crops					

5 Crop Production

Crop	Yala Season		Maha Season		Reserves for	
	Extent ha	Prodn. Mt	Extent ha	Prodn. Mt	Consumpn	Seed
Paddy						

4.1 Settlement of rents and loans in kind: (kg)

Tenency		Chemicals			
Lease		Fertiliers		Total	

5 Household Income

Source		Rupees	perM/S/Y	
Crops	Paddy			
	Fruits			
	Vegetables			
	Coconut			
	Field crops			
Livestock	Milk			
	Eggs			
	Poultry			
	Pig/Goat			
Off Farm Income				
Cottage Industry				
Hire of Machinery				
Milling				
Selling Finished Products				
Trading				
Money Lending				
Sanurdhi				
Hired Labour				
Other (specify)				

7 Household Expenditure

	Rupees	perM/S/Y	
Payment of Interest			
Food and Beverages			
Clothing			
Transport			
Functions			
Health			
Education			
Entertainment			
Other (specify)			

8 Loans Obtained This Year 2005

Purpose	Month or Season	Source		Amount	Paid	Interset
		1	2			

Do you have unsettled loans that were taken last year or before ?

If YES, what is the outstansing amount ?

9 Where do you sell your surplus produce ?

Crop	Point of Sale	Unit	Quantity	Unit Price

10 Do you hold membrship in rural organizations ?

Organization	Position Held	Membership Fee

11 What benefits do you get by being a member of the Farmer Organization ?

12 Observations

Date Name of Interviewer

AG 02 AGRICULTURAL ASSESSMENT
AG 02-01 Ageicultural survey by participatory method

Annexture 2: Guide to Semi-structured Questionnaire

QUESTIONNAIRE OF GROUP SURVEY: Agricultural Practices and Costs

1 Varieties of Paddy Cultivated in the area:

1.1 Varieties in order of usage (if possible)					
1.2 Cost of seeds Rs/kg					
1.3 Source					

2 Seed Treatment Practices:

Mandays	Description:

3 Land Preparation:

3.1 Activities prior to ploughing operation

1 General land clearing Operation		mandays
2 Weedicide application		

Chemical	Cost	Source	Timing	Mandays	Description:

3.2 Machinery and Equipment Used:

1 Machine	2 W Tr	4 W Tr	buffolo	neat cattle	Description
2 Equipment	Mould B	Disc	Tyne	Rotovator	
3 No of times	1st plough	2nd plough	3ed plough	levelling	
4 Cost per operation					
5 Lobour used mandays					

4 Sowing

4.1 Activities at Sowing Time	Mandays	Description
1 Bund cleaning and plastering		
2 Seed bed preparation		
3 Sowing		
4 Seed rate kg/ha		

5 Ferilizing

5.1 Basal Application

1 Mixed or straight	
2 Quantity	
3 Time of application	
4 Cost	
5 Mandays	

5.2 1st Top Dressing

1 Quantity	
2 Time of application	
3 Cost	
4 Mandays	

5.3 2nd Top Dressing

1 Quantity	
2 Time of application	
3 Cost	
4 Mandays	

5.3 Final Top Dressing TDM

1 Mixed or straight	
2 Quantity	
3 Time of application	
4 Cost	

6 Pest and Disease Control

6.1 Pests

1 Common pests			cost
2 Chemicals used	a		
	b		
	c		
3 Sprayer			
4 Instructions/advise			
5 No. of times			
6 Mandays			

6.2 Diseases

1 Common diseases			cost
2 Chemicals used	a		
	b		
	c		
3 Sprayer			
4 Instructions/advise			
5 No. of times			
6 Mandays			

7 Weed Control

Describe 6 and 7

7.1 Common weeds			
1 Cultural methods			
1 Common pests		cost	
2 Chemicals used	a		
	b		
	c		
3 Sprayer			
4 Instructions/advise			
5 No. of times			
6 Mandays			

8 Irrigation

Mandays (per rotation)	Describe:

9 Harvesting:

		Describe
9.1 Timing		
9.2 Method		
9.3 Heaping		
9.4 Drying		
9.5 Mandays		
9.6 Cost		

10 Post Harvest:

10.1 Threshing

	Buffalo	4 W Tr	Thresher	Big Thresh
1 Method				
2 Cost				
3 Mandays				

10.2 Winnowing

	Fan	Wind
1 Method		
2 Cost		
3 Mandays		

10.3 Bagging

11 General

11.1 Credit

Amount	Source	Comment

11.2 Extension

No. Visits	No Contact	Comment

11.3 Marketing

Qty Sold	To Whom	Price	Comment

AG-02 Agricultural Assessment
AG-02-04 Survey of Agricultural Staff on Field Constraints

Sample 1: Questionnaire

AGRICULTURAL INSTRUCTORS/SMOs/Segment AO

Please write down your comments: (a) in order of relative importance
(b) in Sinhala or English

Name _____ Age (Yrs) _____ Range _____

Segment _____ Scheme _____

Professional Qualifications

	Institution	Qualification	Year
1			
2			
3			

Years of Service as an Agricultural Instructor

Years of Service in the District

Mode of Transport Off.Vehicle Mobike Pub. Trans

In-Service and Other Training

YEAR 2004

	Name of the Program	Institution & Country	Period (Y/M/D)
1			
2			
3			
4			
5			
6			

YEAR 2005

	Name of the Program	Institution & Country	Period (Y/M/D)
1			
2			
3			
4			
5			
6			

Do you think the present training programs are adequate to carry out your services satisfactorily ?

Yes	No

If NO, what are the subject areas that you think need strengthening by further training ?

1 _____
2 _____
3 _____
4 _____
5 _____

What are the major problems or difficulties you face in carrying out your usual duties ?

1 _____
2 _____
3 _____
4 _____
5 _____

In your view, what the major problems or difficulties the farmers in your area face in carrying out their farming practices

1 _____
2 _____
3 _____
4 _____
5 _____

[Sample of Questionnaire]

TECHNICAL SPECIFICATIONS FOR MARKETING SURVEY ON AGRICULTURAL PRODUCTS IN THE STUDY ON INCREASING THE CAPACITY OF INTERGRATED MANAGEMENT OF IRRIGATION SECTOR IN SRI LANKA

SECTION 1 GENERAL

1.1 Objective of the Work

Objective of the Work is to provide basic information on marketing of agricultural products in the target areas to the JICA Study Team. The basic information on marketing of agricultural products shall be submitted to the Study Team in the form of reports based on i) macro-level market information, and ii) detailed field survey and case study of the current marketing situation in the target area.

1.2 Target Area of the Work

Target area of the work shall consist of Study areas; Rajangana and Nachchaduwa irrigation schemes and the surrounding area, market centers; Colombo, Dambulla, Maradagahamula (rice wholesale market), retail and consumer markets.

1.3 Agricultural Products

Agricultural products shall include raw, semi-finished and finished crop products, animal products and fish currently produced in the Study area as well as other products that have a potential for future development in the Study area. The products are identified in Annex I.

1.4 Scope of the Work

1) Submission of Implementation Plan

The Contractor shall propose and submit to the Study Team an implementation plan on equipment and materials use and staff deployment along with a work schedule for approval by the Study Team before the commencement of work.

2) Preparation of Report

The report will contain two sections, namely the macro-level information and the detailed study of the current marketing situation.

The macro-level information will consist of published data and information on government policy issues on agricultural marketing, supply and demand situation, export and import of agricultural products, product prices and price behavior over the past 10 year period at the national level.

The detailed survey of the current situation will contain primary and secondary data and information on seven items.

1) Marketing channels and agencies

1.1) Marketing channels for each product from primary producer to the consumer/exporter.

1.2) Mechanisms of transferring ownership of products from the producer to the consumer/exporter through the agencies involved in the marketing channels

1.3) Volume of products (quantities) handled by each agency.

1.4) Consumer/exporter response to product quality

1.5) Product losses in the process of goods transfer from producer to consumer

2) Pricing

2.1) Mechanism of price fixing of agricultural products, including the various cost components at each transfer point in the marketing channel.

2.2) Price fluctuation of agricultural products at farm-gate, collector and wholesale market over the seasons and over the years (Min. 2 years).

2.3) Method and terms of payment and the volume by each product handled at the points of goods transfer in the marketing channel.

3) Marketing functions of the producer

3.1) Post-harvest practices from point of harvesting to selling for each product including harvesting condition such as maturity, weather, moisture content, etc., product preparation for the market such as cleaning, sorting, packing, etc. and product losses.

3.2) Costs of product preparation including labour, machinery and materials.

3.3) Risk management and price decision

3.4) Transport of products from the farm to consuming areas including the modes and costs to the farmer.

3.5) Production loans obtained from credit supply sources with sales agreements.

3.6) Home consumption, reservation for seeds and sales to different buyers

4) Marketing facilities in and around the Study area

4.1) Local assembly markets or pola and public markets, their numbers, present condition, locations, product type and volumes handled including location maps and facilities available

4.2) Wholesale markets in Dambulla, Maradagahamula, Kurunegala, Anuradhapura and Colombo, their capacities, present condition and the facilities available.

4.3) Processing and storage facilities, their numbers, operational systems, capacities, present condition, locations along with location maps.

4.4) Road and transport situation, the condition of the main marketing routes and market roads in the Study area, time taken to transport goods between two points, transporters operating in the Study area, type and capacities of transport vehicles available.

4.5) Cottage level processing of agricultural products including raw materials used, processes, finished products, marketing, involvement of farm women.

5) Marketing support services

5.1) Marketing services including MIS provided by government institutions, NGOs, private sector and community organizations

5.2) Capacity of the government officials engaged in providing marketing services

5.3) Coordination of support services

6) Problems of marketing

6.1) Identification of the major problems and issues in marketing of agricultural products in the Study area.

6.2) Suggestions to solve the main problems faced by farmers

7) Case study of group marketing of agricultural products

The report shall consist of text, tables, figures, maps and photographs, and should

be annexed with list of references, data sources, detailed records of individual and group discussions and interviews and other supporting documents.

SECTION 2 Methodology of the Work

The work shall be conducted through instruction and discussion with the Study Team. The methodologies of the Work are as follows:

2.1 Collection of secondary data

2.2 Collection of primary data through field surveys conducted in the target area. Participatory approach may be adopted to collect data and information by administering semi-structured individual and group interviews supported by direct observation

2.3 The interviews conducted shall include producers, consumers, intermediaries in the marketing channels and officials of the organizations providing marketing support services.

2.4 Each interview conducted should carry the identification and location (address) of the respondent

2.5 The specifications on the minimum numbers and type of interviews to be carried out at in the survey are given in Annex II。

2.6 The data and information collected should be analyzed and presented in the form of a report.

ANNEX I

Detailed Survey of Agricultural Products

Category	Products	Number of Items
Cereals:	Paddy, Maize, Kurakkan	3
Vegetables:	Tomato, Eggplant, Bitter gourd, Snake gourd, Loofah, Long bean, Okra, Radish, Chilli (green and red), Onion (red and big) Capsicum, Cabbage, Bean, Cauliflower, Beetroot, Carrot, Pumpkin, Cucumber, Ash-plantain, Tibbatu, Batu, Kancun	5
Grain Legumes:	Blackgram, Greengram, Cowpea, Soybean, Groundnut	3
Fruits:	Mango, Papaya, Banana, Melon, Citrus, Pomegranate, Pineapple	3
Others:	Sesame, Drumstick, Coconuts, Green Leaves	1
TOTAL		**15**

Case Studies on Animal Products

Category	Product	Number of Items
Animal Product:	Milk, Eggs, Poultry, Goats, Pig	2
Fish Products:	Fresh fish, Dried fish	1
TOTAL		**3**

Note: In categories where the number of products exceed the number of survey items, the most important products in terms of income generation and scale of operation should be selected.

ANNEX Ⅱ: Specification of interview survey

Name of Product	Interviewee	Location	Numbers	Total No.
	Rep. Of Farmers	Rajangana	10	
		Nachchaduwa	10	
				20
	Village Collectors	Rajangana	3	
		Nachchaduwa	3	
				6
	Commision Agent	Colombo	2	
		Dambulla	2	
		Maradagahamula	1	
				5
	Wholesalers	Colombo	2	
		Dambulla	2	
		Maradagahamula	1	
				5
	Retailers	Colombo	2	
		Kandy	2	
		Kuranegara	1	
				5
	Grand total			41

Note:

Name or company name, address of Interviewee and date(day/month) of interview must be recorded.