

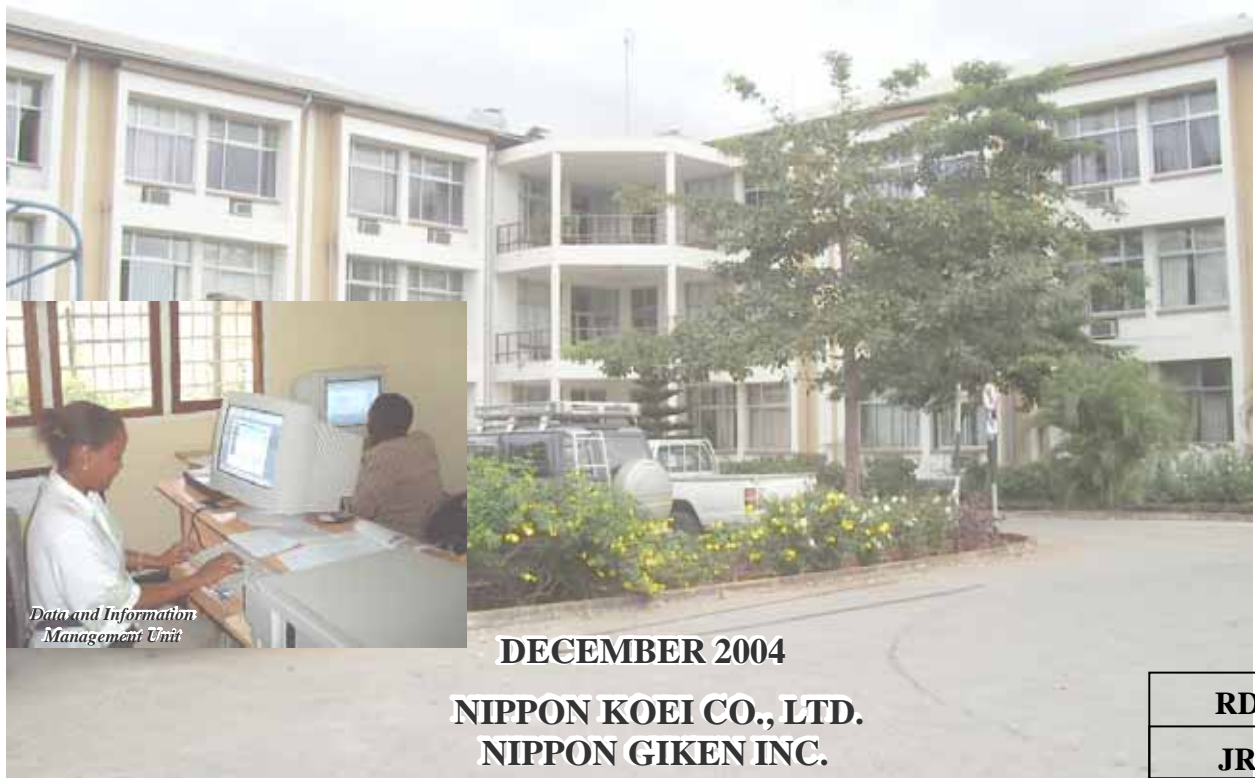
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF AGRICULTURE AND FOOD SECURITY (MAFS)

No.

**THE STUDY
ON
THE NATIONAL IRRIGATION MASTER PLAN
IN
THE UNITED REPUBLIC OF TANZANIA**

VERIFICATION STUDY REPORT

VOLUME-I: MAIN REPORT



DECEMBER 2004

**NIPPON KOEI CO., LTD.
NIPPON GIKEN INC.**

RD
JR
04-28

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF AGRICULTURE AND FOOD SECURITY (MAFS)

THE STUDY
ON
THE NATIONAL IRRIGATION MASTER PLAN
IN
THE UNITED REPUBLIC OF TANZANIA

VERIFICATION STUDY REPORT

VOLUME-I: MAIN REPORT

DECEMBER 2004

NIPPON KOEI CO., LTD.
NIPPON GIKEN INC.

LIST OF REPORTS

VOLUME-I: MAIN REPORT

VOLUME-II: APPENDIXES

Appendix A: Record of Training on Simple Database and Information System (VS-1)

Appendix B: Record of Training on Irrigation Scheme Formulation for DADP (VS-2)

Appendix C: Support for Irrigation Development in Zanzibar

PREFACE

In response to the request from the Government of the United Republic of Tanzania, the Government of Japan decided to conduct the Study on the National Irrigation Master Plan and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent the study team headed by Mr. H. Shimazaki, Nippon Koei Co., Ltd. to the United Republic of Tanzania seven times between November, 2001 and October, 2004.

The team held discussions with the officials concerned of the Government of the United Republic of Tanzania and conducted field surveys, investigations, and workshops in the study area and also held a seminar. During the study period, the team prepared the Master Plan Report, the Action Plan Report, and finally this Verification Study Report.

I hope that this report, along with the Master Plan Report and the Action Plan Report, will contribute to successful irrigation development in Tanzania and to the enhancement of the friendly relationship that exists between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the United Republic of Tanzania for their close cooperation with the study.

December 2004

Etsuo Kitahara,
Vice President
Japan International Cooperation Agency

December 2004

Mr. Etsuo Kitahara
Vice President,
Japan International Cooperation Agency
Tokyo, JAPAN

Letter of Transmittal

Dear Sir,

We are pleased to submit to you the Verification Study Report prepared as part of the Study on the National Irrigation Master Plan in the United Republic of Tanzania. This report presents the results of study conducted to verify the bottlenecks for successful irrigation development in Tanzania that were identified in the Master Plan and Action Plan studies.

The Government of Tanzania has been promoting decentralization since 1996. Following from this decentralization drive, the Agricultural Sector Development Programme has launched the preparation of District Agriculture Development Plans (DADPs). Irrigation development will gradually be transferred from the central government to the district governments and be implemented under DADPs. However, the district governments do not have adequate experience in and knowledge on irrigation development. Most of the irrigation schemes listed in DADPs are not formulated from technical and economical viewpoints and are not suited to delivering sustainable irrigation development. In consideration of this situation, the Verification Study had two objectives: (i) establishment of simple database and information system at DITS of MAFS, and (ii) support for the formulation of irrigation schemes for inclusion in DADPs.

In the Verification Study, the simple database and information system was established and an operation manual for it was prepared. In addition, practical guidelines on irrigation scheme formulation were also prepared for the government staff. The government staff successfully carried out data and information management and irrigation scheme formulation using the manual and guidelines. All the government staffs participating in the study were of the opinion that the simple database and information system, operation manual, training kit and guidelines prepared were extremely useful and helpful for smooth irrigation development. The guidelines were translated into Swahili for easier understanding of the district staff.

We hope that this report will be useful for irrigation development in Tanzania and will finally contribute to achieving food security and poverty reduction.

We wish to express our deep appreciation and sincere gratitude to the officials concerned of your Agency, the Ministry of Foreign Affairs, and the Ministry of Agriculture, Forestry and Fisheries of the Government of Japan for the courtesies and cooperation kindly extended to our team. We also express our hearty gratitude to the officials concerned from the Tanzania Office of JICA, the Embassy of Japan in Tanzania, the Ministry of Agriculture and Food Security of Tanzania, district governments, and also other ministries represented as Steering Committee members for the close cooperation and various forms of assistance extended to our team during field investigations and studies in Tanzania.

Very truly yours,

Hitoshi SHIMAZAKI
Team Leader of the Study Team for the
Study on the National Irrigation Master Plan



LOCATION MAP

PHOTOS (1/2)

Verification Study -1:

Establishment of Simple Database and Information System at DITS MAFS



Training the counterparts

DIMU staff doing the exercises based on the training kit.



Presentation to DITS staff

DIMU staff demonstrating functions of the database system to DITS staff.

Verification Study -2:

Support for Irrigation Scheme Formulation for DADPs

Mvomero District



Screening of All Irrigation Schemes

District staff setting screening criteria for selecting high potential schemes for preliminary planning.



Resource Mapping

Villagers preparing village resource map under the guidance of district staff.



River discharge measurement

District staff measuring river discharge, a key process of the field survey.



Preliminary planning

District staff preparing preliminary scheme development plan applying the "Guidelines for Irrigation Scheme Formulation".

PHOTOS (2/2)

Mkuranga District



Interviewing the stakeholders

District staff obtaining information from the farmers.



Simple Soil Texture Test

District staff conducting simple soil texture test without equipment under the consultation of the JICA Study Team.



Screening of all irrigation schemes

District staff setting criteria to choose high priority irrigation schemes in the district.



Feedback Workshop

District staff explaining the final result of preliminary planning to villagers in non-selected scheme to motivate them to take the next opportunity.

Seminar on the Verification Study:

Dissemination of effect of the Verification Study to districts under territory of the Morogoro Zonal Irrigation Unit



Explanation of the Summary of the Verification Study

Division of Irrigation Technical Services (DITS) staff explaining summary result of the Verification Study.



Explanation of the Findings in the Irrigation Scheme Formulation

District staff presenting his findings in the irrigation scheme formulation in the district.

**THE STUDY
ON
THE NATIONAL IRRIGATION MASTER PLAN
IN
THE UNITED REPUBLIC OF TANZANIA**

VERIFICATION STUDY REPORT

SUMMARY

1 INTRODUCTION

(1) Authority

This Verification Study Report was prepared in accordance with a Scope of Work for the Study on the National Irrigation Master Plan (the Study) agreed between the Ministry of Agriculture and Food Security, the United Republic of Tanzania (MAFS) and the Japan International Cooperation Agency (JICA) on April 10, 2001.

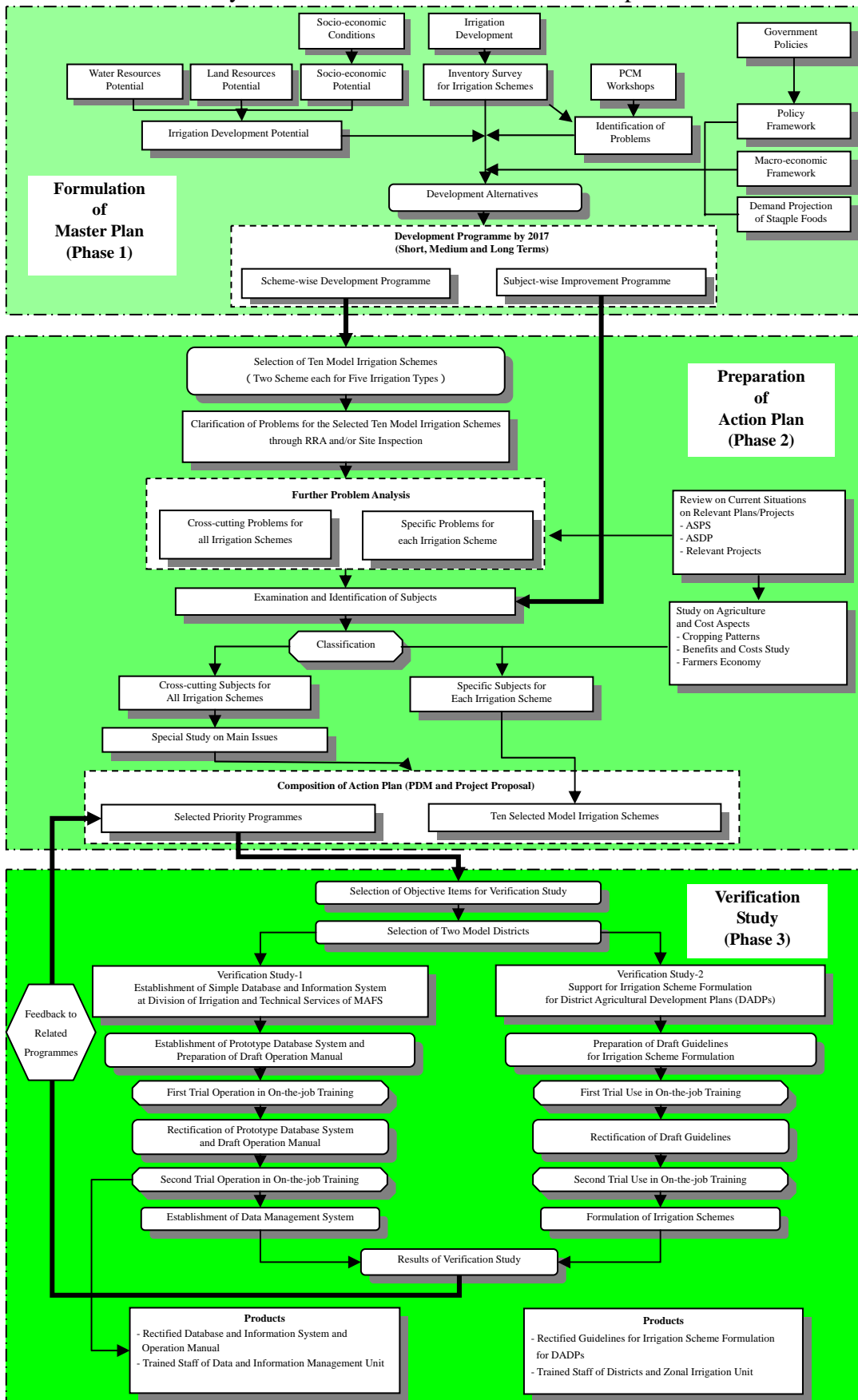
(2) Report Composition

This report presents not only the results of the Verification Study, but also the outline of the Master Plan Study in Chapter 2 and the Action Plan Study in Chapter 3, to clarify the relationships among them. The results of the Verification Study are given in Chapter 4 to Chapter 12.

(3) General Work Flow for the Study on the National Irrigation Master Plan

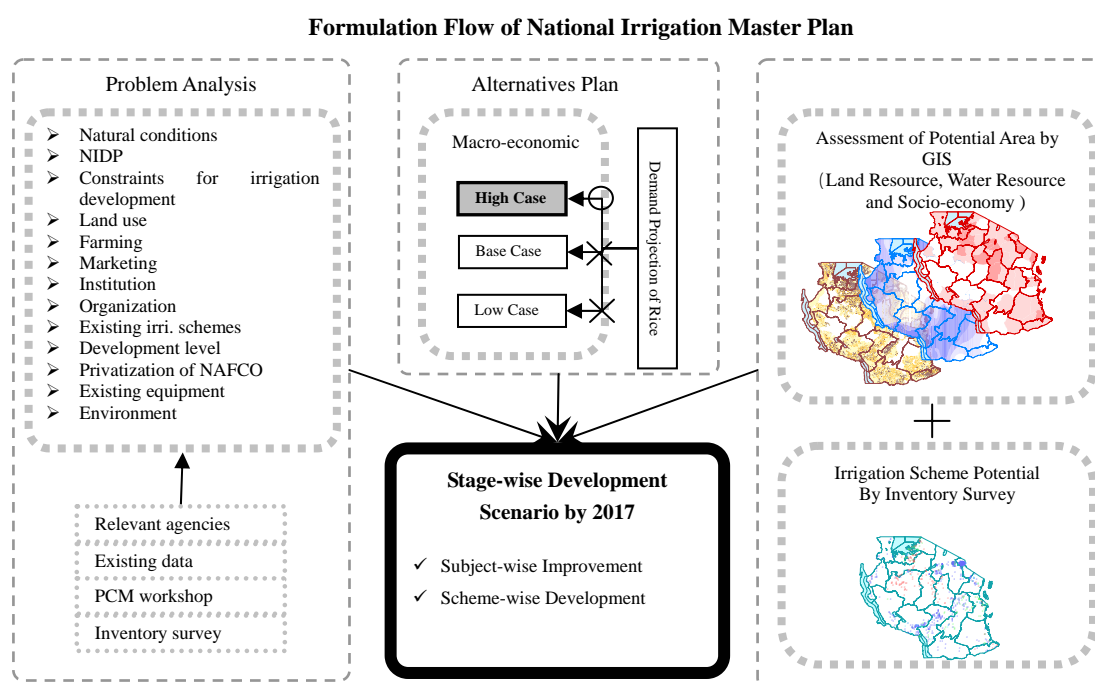
The Study on the National Irrigation Master Plan was executed phase-wise in three stages, Phase 1: Master Plan Study, Phase 2: Action Plan Study and Phase 3: Verification Study. In Phase 1, irrigation development potential was identified from the viewpoints of water resources potential, land resources potential and socio-economic potential. Development programme by 2017 consisting of scheme-wise development programme and subject-wise improvement programme, was prepared for short, medium and long terms, through development alternative study. In Phase 2, ten model irrigation schemes were selected from the scheme-wise development programme. Site inspection and Rapid Rural Appraisal were conducted for five schemes each, to confirm the subject-wise improvement programme mentioned above. Action Plan was prepared for the ten model irrigation schemes and the selected priority programmes from the subject-wise improvement programme. In Phase 3, the Verification Study was made for bottleneck problems for successful irrigation development, which were identified

from the selected priority programmes as the results of the Master Plan Study and the Action Plan Study. General work flow for these three phases is shown below.



2 OUTLINE OF THE MASTER PLAN STUDY

- (4) Objectives
 - (a) Formulate the Master Plan for irrigation development at a national level with a target year of 2017
 - (b) Carry out technology transfer to the counterpart personnel through on-the-job training in the course of the Study
- (5) Formulation Flow of the Master Plan Study



(6) Inventory Survey and PCM Workshops

There are 1,428 inventoried schemes in total, consisting of 739 irrigation schemes inventoried by World Bank and 689 irrigation schemes in the study, which covered the entire Mainland of Tanzania. The inventory survey indicated a total irrigation area of 854,000ha.

In the study, PCM Workshops were held five times, and then for each subject, objective analysis was done for problem analysis. Themes and participants of respective PCM Workshops are given in the table at the right.

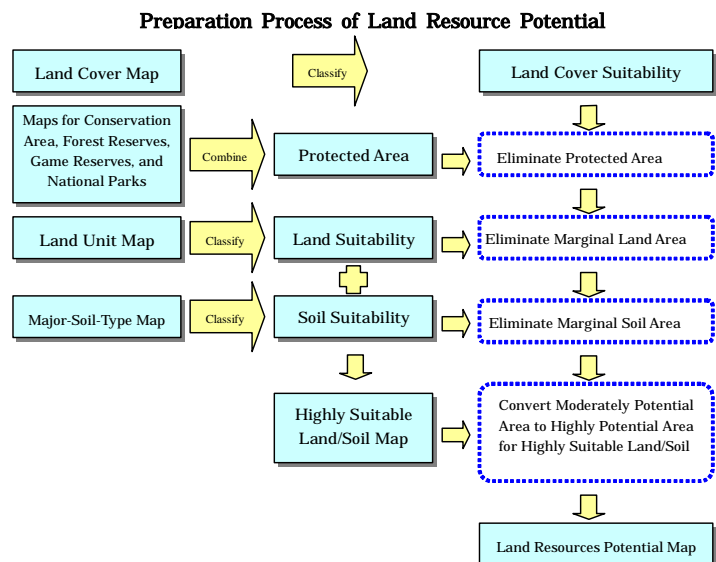
PCM Workshops	
Themes	Participants
Awareness of irrigation management	Irrigation Section of MAFS Zonal Irrigation Units
Ineffective performance of irrigation section	Irrigation Section of MAFS Zonal Irrigation Units Project Manager of Irrigation Projects
Poor support to irrigation farming by Local Government	District Governments Extension Workers
Water scarcity on farm plots	Irrigators' Associations Extension Workers
Poor development of irrigation farming	Farmers' Representatives District Government

(7) Potential Area of Irrigation Development

In general, irrigation development potential is assessed from the water resources potential and land resources potential only. In this study, socio-economic potential is also taken into consideration, because marketing conditions are very important for irrigation development and largely influence the selection of irrigation schemes. The possible extent of irrigation development is determined by preparing and overlaying the assessment maps for the respective potentials mentioned above. Then, locations of the inventoried irrigation schemes were plotted on the irrigation potential map to examine the consistency between the map and the inventoried irrigation schemes. The results were used for regional development planning. Indicators employed for assessment are as follows:

Land Resources Potential

Land resources potential was assessed using land cover, topographic and land unit maps, as shown in the figure on the right:

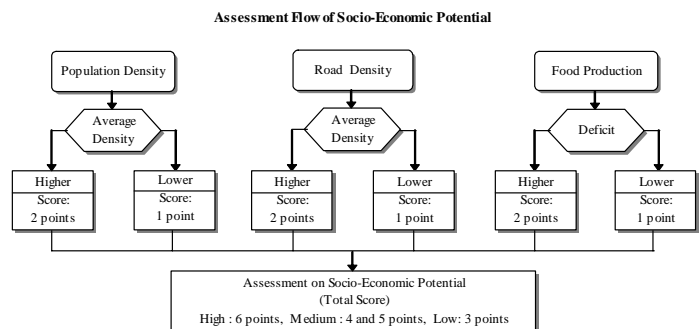


Water Resources Potential

A high potential area is defined as an area with an average annual specific run-off of more than $1.0\text{m}^3/\text{sec}/500\text{km}^2$.

Socio-economic Potential

Socio-economic potential was assessed using the following three indicators, population density, road density and food production, as shown in the figure to the right:



(8) Framework for Irrigation Development

Primary Objective of ASDS

The ASDS states that its primary objective is to create an enabling and conducive environment for improving the productivity and profitability of the agricultural

sector as the basis for improved farm income and rural poverty reduction in the medium and long term.

Purpose of the National Irrigation Master Plan (NIMP)

In view of the strategic activities/interventions stipulated in the ASDS and the philosophy employed in the National Irrigation Development Plan (NIDP) and also the study results, “Sustainable Irrigation Development” was selected as one of the purposes of the NIMP with emphasis on comprehensive measures through “Effective Use of National Resources”, to largely contribute to attainment of the primary objective of ASDS.

Strategy of NIMP

The NIMP proposes the two ideologies of Scheme-wise Development and Subject-wise Improvement, and a close linkage between them as a strategic approach to sustainable irrigation development. The Subject-wise Improvement aims at creation of an appropriate environment for sustainable irrigation development, mainly from a viewpoint of enhancing quality. The Scheme-wise Development aims at expansion of irrigation areas and variation through effective use of national resources including financial resources. The Programmes for both shall be prepared in consideration of five elements; “Economically Sound”, “Technically Appropriate”, “Sociologically Sustainable”, “Institutionally Reliable” and “Environmentally Friendly”.

(9) Alternative Study on Development Plan

Through the analysis on actual development and recurrent expenditures to irrigation development from 1998/99 to 2002/03, the necessary financial resources are projected for three cases: High Case, Base Case and Low Case. A comparison of demand projections for rice in the three cases showed that, subject to proper agricultural input supply, the irrigation development areas under the High Case would satisfy the rice demand in 2017. The development scenario in the NIMP was thus drawn for the High Case

Conditions of Sensitivity Analysis

	Base Case	High Case	Low Case
GDP Growth Rate	5.8% for 2003 – 2008 5.9% for 2008 – 2012 6.0% for 2013 – 2018	1.0% p.a. above Base Case	5.1%/annum for entire NIMP period
Budget allocation to Irrigation Development	1.5%	1.7%	1.5% (No change)
Out-of-budget (Donors Assistance)	100% (Same amount of foreign fund portion))	110%	100 % (No change)
Amount in million Tsh.	350,042	451,251	327,967
Amount in million US\$	369	475	345

(10) Stage-wise Development Scenario

The development programme for implementing the NIMP, targets the establishment of a sustainable irrigation development system by 2017 in a

stage-wise development: Short Term (2003 – 2007), Medium Term (2003 – 2012) and Long Term (2003 – 2017).

Stage-wise Irrigation Development Scenario			
	Short Term (2003 -2007)	Medium Term (by 2012)	Long Term (by 2017)
Development Target	To Establish Sustainable Irrigation Development System by 2017		
Key Issue for each Term	Reform	Decentralization	Self-reliance
Subject-wise Improvement			
Strategic Approach	<ul style="list-style-type: none"> - Reform of environment for promotion of decentralization and involvement of private sector - Establishment of appropriate technologies on irrigation development in cost-effective concept - Dissemination of concept of river basin approach - Establishment of irrigation development system by participatory approach 	<ul style="list-style-type: none"> - Actualization of irrigation development by LGA's initiatives under decentralization - Application of appropriate technologies on irrigation development in cost-effective concept - Establishment of environmental protection method on irrigation - Establishment of farmers-oriented irrigation development system 	<ul style="list-style-type: none"> - Establishment of easy access system from farmers on technical support - Spred of environmental protection method established - Establishment of self-reliant irrigation development by private sector-oriented with public sector partnership
Activities	Prepare and apply tailor-made improvement programme for project sustainability		
Scheme-wise Development			
Strategic Approach	Expand the irrigated area through development of irrigation schemes in effective use of national resources		
Activities	Give priority to rehabilitation of small-scale irrigation and water harvesting schemes		
Expected Annual Growth Rate of GDP	5.8 % to 6.0 %		

Subject-wise Improvement Programme

The Subject-wise Improvement Programme consists of several programmes including (i) institution, (ii) organization, (iii) technical issues, (iv) data and information control, and (v) environment. Thirty-seven programmes were designed based on the results of PCM Workshops, problem analysis and inventory surveys.

Scheme-wise Development Programme

The 1,428 inventorized irrigation schemes, of which the irrigation area was estimated to be about 854,300ha, were prioritized using the criteria. Based on the prioritization results of the irrigation schemes and projected development budget, the irrigation development areas are estimated as follows:

Accumulated Irrigation Development Area

Type of Irrigation Schemes to Be Developed	Short Term	Medium Term	Long Term
	2003 - 2007	by 2012	by 2017
(a) Rehabilitation of traditional irrigation schemes	180,000 ha	216,000 ha	274,000 ha
(b) Development of water harvesting schemes	42,000 ha	57,000 ha	68,000 ha
(c) New smallholder schemes	44,000 ha	52,000 ha	63,000 ha
Total	266,000 ha	325,000 ha	405,000 ha

(11) Conclusions

The study presents the framework and strategies for sustainable irrigation development for the Mainland with the target year of 2017, aiming to contribute to creation of an enabling and conducive environment for improving productivity and profitability of the agricultural sector. In order to achieve this aim, the study prepared the development programme toward the year 2017. As a result, the study selected 37 programmes of the Subject-wise Improvement Programme and 626 irrigation schemes of the Scheme-wise Development Programme.

The study concludes that implementation of these programmes would have a high probability of supplying the future demand for rice by 2017 with successful inter-sectoral coordination.

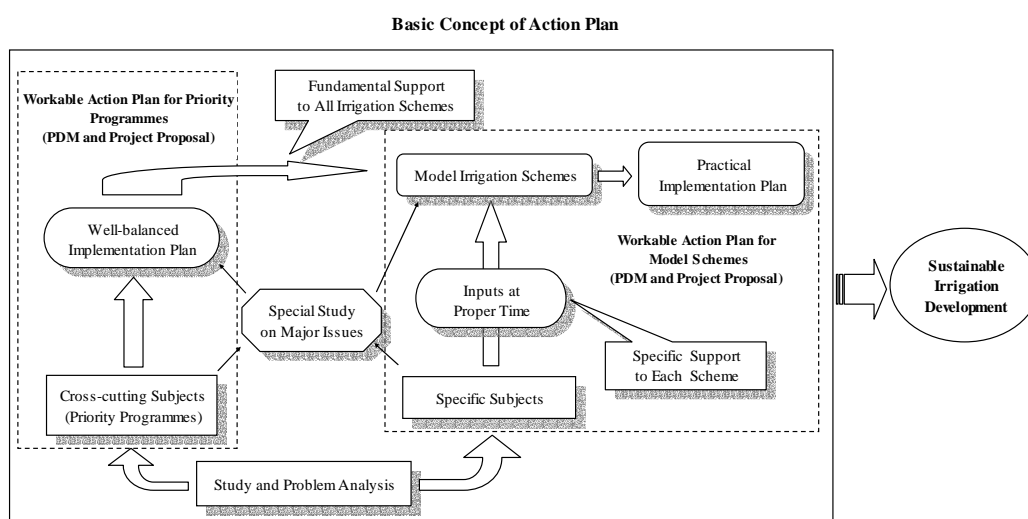
3 OUTLINE OF THE ACTION PLAN STUDY

(12) Objectives

- (a) Clarify 5W1H (Who, Why, When, Where, What, How) on implementation of the selected priority programmes for the Subject-wise Improvement Programme and the Model Irrigation Schemes for Scheme-wise Development
- (b) Carry out technology transfer to the counterpart personnel through on-the-job training in the course of the study

(13) Basic Concept

The workable Action Plan for the selected priority programmes and model irrigation schemes shall be worked out based on the following basic concept:



(14) Selection of Model Irrigation Schemes

Selection purposes of the model irrigation schemes are to show the workable

Action Plan for each of them, taking into account suitable application time of the specific subject programmes, and to confirm the selected priority programmes, based on the results of RRA and/or site inspection for them. The ten model irrigation schemes were selected from 626 schemes to be implemented by 2017. The table below shows the model irrigation schemes with their expected effects as models, which were finally selected under initiative of the MAFS.

Finally Selected Model Irrigation Schemes

Irrigation Type	Region	District	Scheme Name	Area (ha)	Expected Effect as Model
Traditional Scheme	Lindi	Lindi Rural	Kinyope	480	Typical improvement of traditional scheme at low cost
	Tanga	Korogwe	Magoma	250	Improvement in flooded area
Improved Traditional Scheme	Kilimanjaro	Hai	Musa Mwinjanga	676	Low-cost rehabilitation of traditional scheme once improved
	Iringa	Iringa Rural	Pawaga	2,000	Rehabilitation of large-scale traditional scheme once improved
Water Harvesting Scheme	Kigoma	Kigoma Rural	Pamila	30	Pilot scheme of new water harvesting technology
	Dodoma	Kondoa	Kisese	50	Appropriate approach to water harvesting scheme for vegetable cultivation in large area
Modern Scheme	Kilimanjaro	Moshi Rural	Lower Moshi	1,560	Measures to resolve water conflict in river basin
	Morogoro	Morogoro Rural	Mgongola	620	Expansion scheme centering on the pilot scheme
Pump Scheme	Mwanza	Sengerema	Luchili-Nyakasungwa	20.5	Effective approach to pump schemes using lake water
	Kagera	Bukoba	Nkenge	32	Use of groundwater and surface water in conjunction

(15) **Analysis of Model Irrigation Schemes**

RRA and/or site inspections were carried out for the ten selected model irrigation schemes, aiming to (i) clarify operation and maintenance activities, including water management and financial sources, (ii) determine the present activities of farmers' organizations and their relationship with government authorities, and (iii) collect data and agricultural information. The results of these fieldworks highlighted the core problem of "Unstable irrigation water supply to the field", so that the core objective of "Realization of stable irrigation water supply to field" was determined. The analysis identifies the common problems and their development approaches.

Development Approaches to Common Problems

Common Problems	Development Approaches
- Deterioration of irrigation infrastructures	- Construction, rehabilitation and improvement of irrigation infrastructures
- Insufficient maintenance works by farmers - Lack of farmers' skills for water distribution	- Enhancement of farmers' skills for operation and maintenance of irrigation infrastructures
- Poor management skill of IA, such as financial management, leadership, and decision making	- Strengthening of IA management capacity

(16) Selection of Priority Programmes

The Action Plan Study identified the need of further three programmes, so that the identified programmes came to be 40 in total. The priority programmes were thus selected from those 40 programmes in consideration of the current progress of ASDP implementation, the cross-cutting countermeasures determined through RRA and the strategic targets for the Short Term development programme presented in the Master Plan, such as (i) reform of the environment for promotion of decentralization and improvement of the private sector, (ii) establishment of appropriate technologies for irrigation development in a cost-effective concept, (iii) dissemination of the concept of a river basin approach, and (iv) establishment of an irrigation development system by a participatory approach. Tabulated below are the selected 18 priority programmes:

Selected Priority Programmes among the Subject-wise Improvement Programmes

Ref.	Programmes
(1) Institution	
A1	DITS Institutional Improvement Programme
A2	LGA Institutional Strengthening Programme for Irrigation Development
A3.1	New Legal Framework for IA Establishment Study
A3.2	IA Organizing and Registration Support Manual
A3.3	IA Management Training for Farmers
(2) Administration	
B1	Regularization of Irrigation Administration and DITS Working Mandate Formulation Programme
B2	Contract Management System Improvement programme
(3) Technology	
C1	Survey and Investigation Guideline Establishment Programme
C2.1	Planning Guideline Establishment Programme
C2.2	Designing Guideline Establishment Programme
C3.1	O&M Guideline Establishment Programme
C4	Farmers' Participation in Irrigation Development Programme
C5	Village Irrigation Development Guideline Establishment Programme
C7	Establishment of DADP Formulation Guideline for Irrigated Agriculture Development
(4) Information	
D2	Technical Manuals Handling Guideline Establishment Programme
D3	Information and Database Improvement Programme
(5) Environment	
E1.5	Environmental Assessment Study for Irrigation Practice in Tanzania
E1.6	Study of River-Basin Approach in Irrigation Development

Source: JICA Study Team

(17) Special Study on Major Issues Identified in Problem Analysis

Many problems and constraints hindering sustainable irrigation development have been clarified through review of relevant reports and execution of inventory surveys, PCM, RRA and site inspections for the existing irrigation schemes. The results of analysis of these problems and constraints pose some key issues that largely influence successful irrigation development. These are (i) scheme

implementation process, (ii) Irrigators' Associations, (iii) Farmers' participation and a bottom-up approach, (iv) Agricultural inputs supply and marketing of farm products, (v) Environmental considerations, and (vi) Irrigation regulations. The preliminary study was given to them, and the results were incorporated into the Action Plan for the selected priority programmes and the model irrigation schemes.

(18) Action Plan for Priority Programmes

Basic Concept

The basic concept for preparation of the Action Plan which will be implemented in the Short Term (2003 to 2007), is to create an appropriate environment toward sustainable irrigation development from economically sound, technically appropriate, sociologically sustainable, environmentally friendly and institutionally reliable viewpoints, aiming to attain the strategic targets in the Short Term proposed in the Master Plan.

Action Plan

The Action Plan for priority programmes were compiled in form of project proposals and Project Design Matrices, and summarized below:

Priority Programme	Objectives
(a) DITS Institutional Improvement Programme (Code No.A1)	<ul style="list-style-type: none"> - To diagnose the organizational structure and management of the DITS, in particular, focusing on its appropriateness for implementation of NIMP. - To implement the institutional improvement of the DITS based on the diagnosis so that it can execute its mandates successfully.
(b)LGA Institutional Strengthening Programme for Irrigation Development (Code No. A2)	<ul style="list-style-type: none"> - To diagnose the organizational structure and management of the LGAs, mainly focusing on the appropriateness of DALDOs for implementation of NIMP. - To implement the institutional improvement of the DALDOs based on the diagnosis, so that they can execute their mandates successfully.
(c)New Legal Framework for IA Establishment Study (Code No. A3.1)	<ul style="list-style-type: none"> - To make a recommendation for a new legal framework for the IA, which bestows an appropriate legal status on the IA - To define its rights and liability for irrigation development
(d)IA Organizing and Registration Support Manual (Code No. A3.2)	<ul style="list-style-type: none"> - To make a support manual for organizing and registration of IA, so that the extension service officers of the LGAs can provide the farmers with necessary information on organizing and registration of IA and guide them properly. - To provide a training programme for the extension service officers.
(e)IA Management Training for Farmers (Code No. A3.3)	<ul style="list-style-type: none"> - To prepare a training programme for the IA management. - To provide IA leaders with training services, so that they can improve their management skills and manage their organizations successfully for realization of sustainable self-reliant irrigation development.

(f) Standardization of Irrigation Administration and DITS Working Mandate Formulation Programme (Code No.B1)	- To standardize irrigation administration - To standardize mandates of DITS in accordance with the irrigation regulations.
(g) Contract Management System Improvement Programme (Code No.B2)	- To establish or improve the management system for contracts, which covers contract works and sub-contract tasks on irrigation development.
(h) Survey and Investigation Guideline Establishment Programme (Code No.C1)	- To prepare a practical Survey and Investigation Guideline which is convenient for conducting necessary site surveys and investigations for the sake of executing high-quality planning and designing of new irrigation schemes and rehabilitating existing irrigation schemes
(i) Planning Guideline Establishment Programme (Code No. C2.1)	- To prepare a comprehensive and practical Planning Guideline which is convenient for planning of both new irrigation schemes and rehabilitation irrigation schemes.
(j) Design Guideline Establishment Programme (Code No. C2.2)	- To prepare a practical Design Guideline which is convenient for executing proper design of new irrigation schemes and rehabilitation irrigation schemes.
(k) Operation and Maintenance Guideline Establishment Programme (Code No. C3.1)	- To prepare a practical Operation and Maintenance Guideline which is convenient for conducting proper operation and maintenance of irrigation systems.
(l) Farmers' Participation in Irrigation Development Programmes (Code No.:C4)	- To enhance farmers' participation in irrigation, so that irrigation schemes are properly and continuously managed by farmers' themselves.
(m) Village Irrigation Development Guideline Establishment Programme (Code No.C5)	- To prepare proper guidelines for village irrigation developments like small-scale farmer-managed irrigation developments so as to be easier for LGA's use
(n) Establishment of DADP Formulation Guidelines for Irrigated Agriculture Development Programmes (Code No.C7)	- To prepare proper guidelines for DADP formulation for irrigated agriculture from technical and economical viewpoints.
(o) Technical Manuals Handling Guideline Establishment Programme (Code No. D2)	- To establish a teaching source for properly handling all technical references and information which are definitely important for improving and heightening irrigation technology.
(p) Information and Database Improvement Programme (Code No.D3)	- To establish or improve information systems and databases related to irrigation development, which are definitely necessary for monitoring the progress of irrigation development.
(q) Environmental Assessment Study for Irrigation Practice in Tanzania (Code No.E1.5)	- To conduct an environmental assessment study to correctly identify causal relationships between irrigation water use and environmental issues on water and land.
(r) Study of River-Basin Approach in Irrigation Development (Code No. E1.6)	- To conduct a planning study to correctly determine how to introduce a river-basin approach for irrigation water users.

(19) Action Plan for Model Irrigation Schemes

Basic Concept

The Action Plan for the model irrigation schemes is prepared under the following development concept:

Development Concept to Model Irrigation Schemes

Description	Development Concept
Technical Self-reliance	<ul style="list-style-type: none"> - Planning and design of irrigation infrastructures taking into consideration farmers' capacity for O & M and water management. - Raising of technical knowledge of farmers on O & M and water management, and providing appropriate training to them.
Financial Self-reliance	<ul style="list-style-type: none"> - Formulation of rehabilitation / improvement plan for irrigation infrastructure considering farmers' affordability for O & M. - Preparation of an agricultural development plan, which leads to improvement of farmers' profitability, encouraging them to introduce vegetable farming.
Institutional/Organizational Strengthening	<ul style="list-style-type: none"> - Institutional strengthening for raising organizational management of IA, such as leadership, decision-making, and conflict resolution. - Institutional strengthening for raising financial management by IA, such as collection of water fee and O & M cost. - Promotion of farmers' participation in project implementation during planning, design, and construction periods.

Action Plan

(a) Overall Goal	Improve agricultural productivity and profitability
(b) Project Purpose	Ensure supply of stable irrigation water to the farms
(c) Outputs	<ul style="list-style-type: none"> - Strengthen capacity of IA management. - Rehabilitate or improve irrigation infrastructures. - Enhance skill of farmers for operation and maintenance of irrigation infrastructures.

The 'objectively verifiable indicators' for outputs will be: (i) 80% or more farmers participate in maintenance works by the end of the project, (ii) rehabilitation is completed by the specified year, and (iii) 100% of committee members are trained for O&M by the end of the project. To achieve the outputs mentioned above, the following activities were worked out:

Objectives and Activities

Objectives	Activities
(a) Capacity of IA management is strengthened.	- Raise farmers' awareness to the project implementation.
	- Re-organize structure of IA.
	- Enhance leadership of committee members.
	- Strengthen decision making of IA.
	- Prepare by-laws and regulations.
	- Enhance financial management capacity of IA.
	- Promote registration of IA.
(b) Irrigation infrastructures are rehabilitated or improved	- Conduct survey and investigation with farmers' participation.
	- Conduct EIA.
	- Carry out design works.
	- Make agreement on the project implementation including Programmes of rehabilitation / improvement works and farmers' contribution to the works
	- Carry out pre-implementation activities including tendering and its evaluation.
	- Construct irrigation infrastructures with farmers' participation.
	- Turn-over O&M of completed irrigation facilities to IA.
- Raise farmers' awareness of the project implementation.	
(c) Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced	- Prepare irrigation schedule and maintenance plan.
	- Conduct water distribution.
	- Conduct maintenance works.
	- Enhance skills to mediate and resolve water disputes among members and with outside people
	- Monitor performance of scheme

The Action Plan for model irrigation schemes was also prepared in the form of project proposals and Project Design Matrices.

(20) Recommendations

Support on Irrigation Scheme Formulation Process in DADP

In order to smoothly execute irrigation development under the DADP, it is recommended that practical guidelines on the proper process of scheme formulation should be prepared, and, simultaneously, capacity building should be provided for the district staff concerned. Besides, it is recommended that a simple database system should be established at the DITS of MAFS, to support the district offices by providing necessary data and information for irrigation scheme formulation.

Strengthening of IA

The IA is a main actor for operation, maintenance and management of irrigation schemes. However, most IAs are too weak institutionally, financially and technically to fulfill the above activities. To improve such IAs, it is recommended that the IA Strengthening Programme should be started as early as possible to establish firm IAs that are indispensable for sustainable irrigation development.

Promotion of Farmers' Managed Irrigation Scheme Development

In order to fulfill the target of 405,000 ha of irrigation development area by 2017 as proposed in the Master Plan, irrigation development should be carried out steadily. The farmers' managed irrigation schemes, which could be comparatively easily handled by farmers with less support from the GOT are recommended to be started urgently in cooperation with other sub-sectors on agricultural inputs, extension services, marketing and micro-finance, to enhance the irrigation effect more.

4 GENERAL INFORMATION FOR THE VERIFICATION STUDY

(21) Bottleneck Problems and Objectives for the Verification Study

As the results of the Master Plan Study and the Action Plan Study, there found lots of problems against smooth irrigation development. Out of them, the identified bottleneck problems were (i) Lack of proper irrigation scheme formulation process for DADPs and (ii) lack of data and information management system at DITS, MAFS. The objectives of the Verification Study for these bottleneck problems are thus to prove that (i) Irrigation scheme formulation for the DADPs could be done by the district staff if the appropriate guidelines and support of the

ZIU are available, and (ii) The DITS could achieve proper data and information management if an appropriate database system, including preparation of an operation manual, is established.

(22) The Study Area

Mvomero and Mkuranga Districts were selected as the Study Area based on the criteria of (i) Irrigation development is given a high priority, (ii) Less assistance from other donors, and (iii) Availability of active staff as counterparts, and (iv) Easy access from Dar Es Salaam.

(23) Actual Situation of Data and Information Management at DITS

In order to grasp the effect of the Verification Study, the status of data and information management before the Verification Study was examined through questionnaire surveys to the DITS staff concerned. The results showed that the previous data and information management was partially made by exchanging hard copies of documents, and comprehensive management was not conducted mainly due to (i) lack of skilled staff to establish a database system, (ii) lack of awareness of the importance of a database system, and (iii) limitation of funds.

(24) Actual Situation of Irrigation Scheme Formulation for DADP in Two Model Districts

Mvomero District

Mvomero District does not have its own DADP since the district was recently separated from the Morogoro District. Thus, the actual situation of irrigation scheme formulation for the DADP was examined using the Morogoro District DADP. In the Morogoro District DADP, the Kiroka irrigation scheme had been selected as a candidate for implementation. However, this selection had not been carried out with any proper screening and prioritization criteria due to the limited time given. Besides, the cost estimate was not based on a detailed survey. No logical process had been taken for selection of this candidate scheme for the DADP.

Mkuranga District

The Mkuranga District DADP did not include irrigation development due to limited budget and lack of knowledge of proper irrigation scheme formulation.

Technical Support to District on DADP Preparation by Morogoro ZIU

The results of the questionnaires and interviews with the Morogoro ZIU staff indicated that they did not provide district offices with any technical support on the DADP preparation. However, recently, they are trying to become involved in

the DADP preparation. Because they came to know that some district offices could not take proper action for irrigation development even six months after the budget had been available. The support for irrigation development to the district offices is not, however, being applied systematically.

5 ACTIVITIES FOR THE VERIFICATION STUDY

(25) Framework of the Verification Study

The following two major subjects contributing to smooth irrigation development were selected as components of the study.

Verification Study - 1 (VS-1):

Establishment of simple database and information system at DITS of MAFS

Verification Study - 2 (VS-2):

Support for irrigation scheme formulation for DADP

(26) Basic Approaches to the Verification Study

Basic approaches to the study activities were set to be as follows.

Basic Approach-1:

Linkage with Guidelines and Database System

Basic Approach-2:

Participatory Approach to Guidelines and Database System Preparation

Basic Approach-3:

Introduction of User-friendly Guidelines and Database System

Basic Approach-4:

Preparation of Guidelines Using Data and Information Collected in the Master Plan and Action Plan Studies

Basic Approach-5:

Efficacious Transfer of Data, Information and Technologies Used in the Master Plan and Action Plan Studies through Database System

Basic Approach-6:

Application of Systematic On-the-job Training

(27) Inputs to the Verification Study

Mentioned below are the inputs required for the study.

Establishment of Simple Database and Information System:

- Two DITS staff
- Computer, Scanner, Database software, GIS software, and Office space

Support for Irrigation Scheme Formulation for DADPs:

- Three DITS staff, Three Morogoro ZIU staff, Three Mvomero district office staff, and Five Mkuranga District Office staff
- Transportation, Handheld GPS, Handheld EC meter, and Meeting space.

(28) Activities of the JICA Study Team

(a) Establishment of Simple Database and Information System

Preparation of Prototype Database and Information System

The database system consisting of an “Irrigation Database” and “Irrigation GIS” was firstly established as a prototype with the following major characteristics.

Major functions of Irrigation Database:

- Irrigation scheme profiles function,
- Reference documents function, and
- Topographic map function.

Major functions of Irrigation GIS:

- General features (administrative boundaries, rivers, roads),
- Protected areas (national parks, game reserves, forest reserves, conservation areas),
- Natural Conditions (rainfall, agro-ecological zone), and
- Land Use (land cover, land unit, soil type).

Preparation of Draft Operation Manual

The draft operation manual for the database system was prepared for trial operation by the staff of the Data and Information Management Unit (DIMU) of DITS in the MAFS.

Preparation of Training Kit

The training kit for the simple database and information system was prepared as material for the training activities. This training kit was utilized for the trainees to be situated in various circumstances that may happen during the actual operation of the database system in the future.

Training on Database System Operation

Training on the database system operation was conducted using the prototype database system, draft operation manual and training kit. The training could also be recognized as a trial operation, since it handled actual data in part.

- Training was held based on **Basic Approach-6: Application of Systematic On-the-job Training.**
- Target of the training was to acquire skills to operate the database system in the situations presented in the training kit.
- The following are the training activities conducted.

Training Programme	May	June				July			
	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Data and Information Management Unit									
1) Basic operation	■								
2) Supplying data to districts	■								
3) Enter planning result	■								
4) Plotting scheme location on the GIS	■								
5) Supplying result to DITS	■								
6) Trial operation with actual data			■						
7) Wrap-up presentation to DITS									■

Training Activities Conducted for Database System Operation

Rectification of Prototype Database and Information System

The following rectifications were made for rectification of the database system based on the findings and facts observed through the trial operation.

Rectification of Irrigation Database:

- Provide a function to monitor the development status of irrigation schemes in various development stages,
- Provide a function to revise administrative bodies, and
- Provide passwords to avoid unauthorized operation.

Rectification of Irrigation GIS:

- Enable access to detailed information for each polygon.

Rectification of Draft Operation Manual

The following rectifications were made for finalization of the operation manual.

Rectification of operation manual (concerning Irrigation Database):

- Reorganize structure of explanation to follow the operation order.

Rectification of operation manual (concerning Irrigation GIS):

- Explain basic operation of GIS software (ArcView),
- Explain method to obtain area of polygon data,
- Explain insertion method of graticule to layout, and
- Explain useful functions such as “dissolve” and “clip”.

(b) Support for Irrigation Scheme Formulation for DADP

Preparation of Draft Guidelines

The draft guidelines for Irrigation Scheme Formulation for DADP were prepared for trial use by the district staff in charge of irrigation scheme formulation. The draft guidelines were used in actual conditions, and then the findings and facts observed were utilized for its rectification.

Training for Irrigation Scheme Formulation

Training on the irrigation scheme formulation was conducted using the guidelines.

- Training was held based on **Basic Approach-6: Application of Systematic On-the-job Training.**
- Targets of the training were to acquire skill in irrigation scheme formulation for DADP for district staff and to understand endorsement and validation procedures for ZIU staff.
- The following are the training activities conducted.

Training Programme	May	June				July				
	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	
Mvomero district										
1) Quick site inspection and screening	■									
2) Field survey for selected schemes			■	■						
3) Preliminary planning for selected schemes				■	■					
4) District supporting programme						■	■			
5) Finalization of the result								■	■	
Mkuranga district										
1) Quick site inspection and screening	■									
2) Field survey for selected schemes		■	■							
3) Preliminary planning for selected schemes				■	■					
4) District supporting programme						■	■			
5) Finalization of the result								■	■	

Training Activities Conducted for Irrigation Scheme Formulation

Rectification of Draft Guidelines

The following rectifications were made for the guidelines, based on the findings and facts observed through the trial operation.

Addition to the process

- Add a process for confirming district irrigation development priority.
- Add a process for listing all the irrigation schemes in the district including completed schemes.
- Explain the necessity of preparatory works before the field survey.
- Introduce a process for preparing village resource maps.
- Add a process for making agreement on the proposed area.
- Introduce a process for preparing present situation maps.
- Add procedures for identifying and designing district supporting programmes.

Improvement of the process

- Improve the check list for quick site inspection.
- Introduce stage-wise flow in the screening.
- Improve timing of data collection.
- Rearrange work flow of the field survey according to the time table.
- Explain the process of the water balance study in more detail.
- Rearrange the method of scheme development planning considering availability of topographic maps.
- Introduce detailed calculation methods and various indicators for the scheme incremental benefit estimation.

Simplification of the process

- Simplify the interview survey methods for efficient data collection.
- Simplify soil survey methods based on availability of the equipment.

- Simplify river discharge measurement methods based on the required data.
- Simplify water requirement estimate methods considering availability of the data.
- Simplify a procedure for environmental consideration taking requirements in the scheme formulation stage into account.

Improvement of the explanation

- Provide terminology for the guidelines in order to avoid confusion.
- Explain effective use of the database system.

(c) Verification of the Hypothesis of the Study

Validation of project output (output of the JICA Study Team) and project purpose (outcome of the counterparts) was carried out for verification of the hypothesis of the study. If both project output and purpose were proved to be satisfactory, it could be regarded that the hypothesis of study was verified.

(29) Activities of the Counterparts

The following are the activities of the counterparts.

Establishment of a Simple Database and Information System:

- Two staff of DIMU in DITS were assigned as counterparts of the activities and attended the programmed on-the-job training conducted by the JICA Study Team.

Support for Irrigation scheme formulation for DADP:

- Three staff of Mvomero District office and five staff of Mkuranga District office were assigned as counterparts of the activities and attended the programmed on-the-job training conducted by the JICA Study Team.

6 RESULTS OF THE VERIFICATION STUDY

(30) Products of the JICA Study Team

(a) Establishment of Simple Database and Information System

Product-1: Irrigation Database

Throughout the Verification Study activities, the Irrigation Database was refined as follows and finally accepted as valid by the users.

Purpose	To supply effective information, both to districts for irrigation scheme formulation and to the DITS and for preparing irrigation development strategy
Main user	Staff of DIMU
Development concept	<ol style="list-style-type: none"> 1) Easy operation 2) Easy maintenance 3) Minimum installation cost 4) Effective use of readily available data 5) Compatibility with the data collection system proposed in the guidelines 6) Sustainable database system

Function-1 Irrigation development monitoring function

Available data	Data and information on the nationwide irrigation scheme
Data inquiry and output	Output format-1: Scheme digest A form shows detailed information for a single scheme. Output format-2: Listed outlines A form shows a list of major features of several schemes.

Function-2 Reference documents function

Available data	Title list of collected documents in M/P and A/P Study
Data inquiry and output	Title of documents can be searched by category, keywords, etc.

Function-3 Topographical maps function

Available data	Scanned image of topographical maps
Data inquiry and output	Scanned image of maps can be searched from an index panel.

Product-2: Irrigation GIS

Throughout the Verification Study activities, the Irrigation GIS was refined as follows, and became valid for users accordingly.

Purpose	To supply useful information, mainly to districts for evaluating the irrigation potential of the proposed scheme
Main user	Staff of DIMU
Development concept	1) Easy operation 2) Easy maintenance 3) Effective use of readily available data 4) Supply of useful information for irrigation scheme formulation activities 5) Sustainable system

Function-1 Plotting the location of proposed irrigation scheme on GIS

Available data	Point data mainly obtained through a quick site inspection and polygon data where the data of several points on the perimeter of the scheme were obtained
Data inquiry and output	Output-1: Point Data Distribution of the scheme and the relevant data of each scheme. Output-2: Polygon data Location, shape and the area size of the polygon.

Function-2 Superposition of Thematic Maps on GIS

Available data	- General features such as administration boundaries (zones, regions and districts), rivers, lakes, roads and railways, - Protected areas such as national parks, forest reserves, game reserves and conservation areas, - Natural conditions such as rainfall and agro-ecological zone, - Land related information such as land cover, land unit and soil type.
----------------	---

Data inquiry and output	<ul style="list-style-type: none"> - The distribution of irrigation schemes on any of the thematic maps mentioned above, - Buffer area for the selected theme, - Relevant data for the selected theme, and - Zoom-in image for the detail.
-------------------------	--

Function-3 Printout of Appropriate Layout

Available data	Any view prepared in the manner mentioned above
Data inquiry and output	<ul style="list-style-type: none"> - Suitable scale can be selected with adjusted scale bar, - Suitable legend can be created as per requirements, - Suitable title and north arrow can be created as per requirements, and - Suitable graticules and measured grids can be added as per requirements.

Product-3: Operation Manual for the Database and Information System

Throughout the Verification Study activities, the operation manual for the simple database and information system was refined and finally accepted as valid by the users.

Product-4: Training Kit

Throughout the Verification Study activities, the operation manual for the database and information system was refined and finally accepted as valid by the users.

(b) Support for Irrigation Scheme Formulation for DADP

Product-5: Guidelines for Irrigation Scheme Formulation for DADP

Throughout the Verification Study activities, the draft guidelines for Irrigation Scheme Formulation for DADP were refined as follows and finally accepted as valid by the users.

Purpose	To facilitate irrigation scheme formulation for DADP. The guidelines treat district-manageable-small-scaled irrigation schemes, of which the water source is a river or pond/lake, and also rain water harvesting schemes.
Main users	<ul style="list-style-type: none"> (a) Staff of District offices (b) Staff of ZIU
Development concept	<ul style="list-style-type: none"> (a) User oriented guidelines (b) Provision of guidance for users to communicate with the database system (c) Strengthening of communication with district offices and ZIUs (d) Introduction of a user-friendly format to explain procedures (e) Introduction of data fill forms with standard values (f) Provision of data fill forms with instructions for survey and planning (g) Maximum usage of the data collected in the Master Plan and Action Plan studies (h) Introduction of simple and practical surveying and planning

	methods (i) Introduction of short information
--	--

The contents of the rectified guidelines are as follows:

Contents of the Guidelines

Introduction
Overall Work Flow
Terminology for the Guidelines
Section 1 : Introduction
Section 2 : Procedures to be taken before DADP Stage
Section 3 : Irrigation Scheme Formulation for DADP
Section 4 : Process of Irrigation Development after DADP Stage
Section 5 : Use of the Database System in Irrigation Scheme Formulation
Attachments

Out of five sections in the guidelines, Section 3, which is a highlight in the guidelines, mentions the irrigation scheme formulation process shown on the next page.

(31) Effects of Training

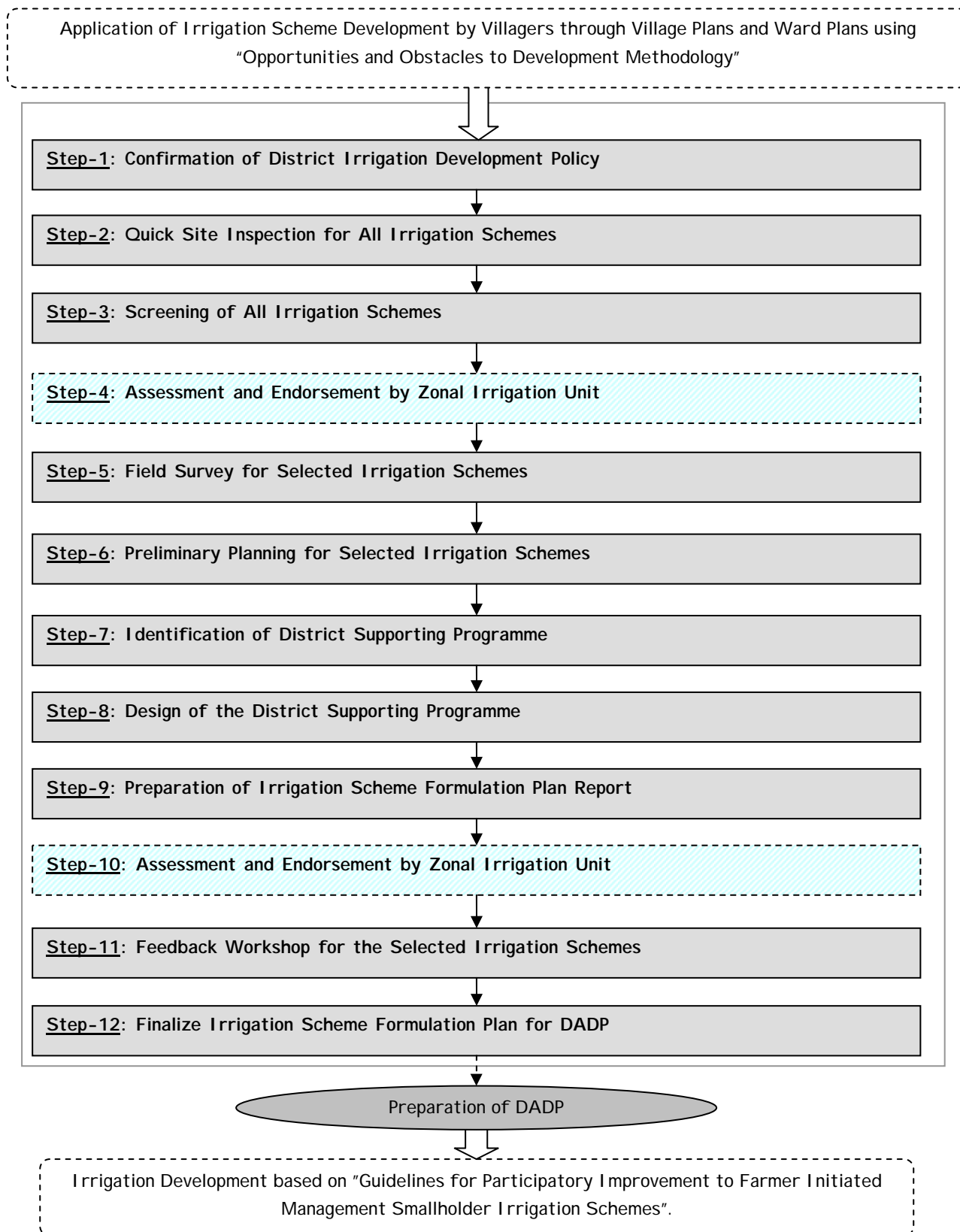
(a) Establishment of a Simple Database and Information System

It was determined by the DIMU staff and the JICA Study Team that the DIMU staff had acquired the necessary level of skill for the operation of the database and information system.

(b) Support for Irrigation Scheme Formulation for DADP

It was determined by the DPDT members along with the JICA Study Team that the DPDT members for Mvomero and Mkuranga District acquired the required skill for irrigation scheme formulation. It was also confirmed that Morogoro ZRC fully understood their role and the system of technical support stipulated in the guidelines.

**Flow of the Irrigation Scheme Formulation Introduced in the Guidelines
(Summary of Section 3 of the Guidelines)**



(32) Outcome of Counterparts

Through the systematic on-the-job training, the following outcomes were produced by the counterparts and those outcomes were assessed by three parties.

(a) Operation of the Simple Database and Information System with Actual Data

The result of VS-1 (Establishment of simple database and information system at DITS of MAFS) was evaluated by comparing data management before/after the Verification Study. It was assessed by the DITS, DIMU and JICA Study Team that the DIMU could successfully store actual irrigation scheme information of two model districts in the database and information system and use that information effectively after the Study.

(b) Irrigation Scheme Formulation for DADP

The result of VS-2 (Support on irrigation scheme formulation for DADPs) was evaluated by comparing status of irrigation scheme formulation before/after the Verification Study. It was verified by the ZRC, DPDTs and JICA Study Team that the DPDTs in two model districts could prepare the irrigation scheme formulation plan successfully. It was also confirmed that the first prioritized scheme was going to be proposed in the next DADP.

(33) Results of the Verification

(a) Establishment of Simple Database and Information System (VS-1)

It was verified that the DITS could execute proper data and information management by establishing the database system including the operation manual.

(b) Support for Irrigation Scheme Formulation for DADP (VS-2)

It was verified that irrigation scheme formulation for DADP could be fulfilled by district staff using the appropriate guidelines and with support of the ZIU.

7 LESSONS LEARNED FROM THE VERIFICATION STUDY

(34) Important Notice on the Use of Guidelines

The practical guidelines were prepared by incorporating the results of trial use, however, should be used paying careful attention upon the following points:

- It must be verified that all handheld GPS units are set to the UTM system rather than the degree-minute system.
- Term “area” must be clearly defined to differentiate between potential area, proposed area, development area, etc.
- Crop yield units must be standardized or clearly defined to eliminate any

possible ambiguity that could arise due to the use of different measuring methods/systems from place to place.

(35) Unforeseen Benefits of Activities for the Verification Study

Through the Verification Study, the following points were found, which was an unforeseen benefit of the Study:

Process of Data and Information Management

- Great importance of irrigation development monitoring by the irrigation database, which served to strengthen the sustainability of the system;
- Searching for the required topographic map in the database prior to attempting to retrieve the original sheet of the topographic map from a map sheaf alleviated the burden of the user in finding the required sheet;
- Confirmation of protected area boundaries by utilizing the Irrigation GIS, eliminated the possibility of construction of the irrigation schemes in prohibited areas; and
- Strengthening collaboration with the related organizations, enriched the contents of database system.

Process of Irrigation Scheme Formulation

- Great significance of quick site inspection to confirm the final scheme site;
- Effectiveness of applying screening criteria with transparency, objectivity and ownership, to give an opportunity to reconsider the district development policy;
- Advantages of preparation of present situation maps in a simple way;
- Identification of the importance of district supporting programme, to attain effective and sustainable irrigation development;
- Need for feedback workshop, to explain to the village people in a transparent process, and to raise their awareness and motivation towards the next selection opportunity;
- Recognition of diligent use of guidelines by district staff;
- Effectiveness of a participatory approach to guidelines finalization, to make full use of users' knowledge and suggestions, socio-economic background and customs;
- Insufficient consideration of technical aspects by district staff;
- Importance of useful technical support from the ZIU, to strengthen the desirable relationship between the ZIU and district offices; and
- Hesitation to intervene in villagers activities by district staff;
- Ignorance of ensuring the required budget for irrigation scheme formulation;
- Impact on creating human resources network by proceeding toward a single

purpose, such as proper irrigation scheme formulation.

Process of Verification

- Need of completing a retrospective evaluation after completion of training.
- (36) DADP Procedures
- Difficulty in irrigation scheme formulation without an O&OD process;
 - Need for overall justification of the village proposed plan, to avoid unnecessary investment;
 - Anticipation of proper planning for other agricultural sub-sectors, to heighten the productivity effect of irrigation development;
 - Need for prioritization criteria of agricultural sub-sectors' development, to make fair selection of priority schemes under the limited budget; and
 - Need for concrete guidelines to avoid conflict of prioritization between national and district levels.
- (37) Subsequent Irrigation Development Stages
- Need for technical support for subsequent development stages to district staff to realize sustainable irrigation development; and
 - Need for collection of basic data necessary for proper irrigation development.

8 CONCLUSION AND RECOMMENDATIONS

(38) Conclusion

VS-1: Establishment of Simple Database System and VS-2: Support for Irrigation Scheme Formulation for DADP, were successfully executed by the staff of DIMU of the DITS and the Districts. Now the database system has been brought to operational level by the DIMU and the appropriate irrigation schemes are ready for the DADP for Mkuranga and Mvomero Districts. This means that the objectives of the Verification Study were fulfilled as planned.

Judging from the results of the Verification Study mentioned above, it was concluded that the MAFS should disseminate the full use of the database system and the irrigation scheme formulation process to all district offices, to realize successful implementation of irrigation development stipulated in the NIMP.

(39) Recommendations

(a) Distribution of Guidelines for Irrigation Scheme Formulation to District Offices

Practical guidelines have been produced as a result of the Verification Study for irrigation scheme formulation, and are now available in the MAFS. It is thus

recommended that the MAFS should distribute the guidelines to all districts in the country immediately after a new version is available, to disseminate the established irrigation scheme formulation, and also to lead to more effective irrigation development at the district level.

(b) Ensuring Sustainability of the Verification Study Effect

- Preparation of Annual Monitoring Report of Irrigation Development

The DIMU is ready for operation and management of the database system. In order to maintain the system well, it is recommended that MAFS should require submission of the annual monitoring reports on the DIMU. These annual monitoring reports will be very useful and helpful for the MAFS to grasp the current conditions of irrigation development in the country.

- Updating and Modification of the Guidelines for Irrigation Scheme Formulation for DADPs

The guidelines should always follow the prevailing circumstances in irrigation development. In order to reflect the latest ones upon the guidelines, it is recommended that the guidelines should be updated and refined whenever necessary.

- Training System for Supporting Irrigation Scheme Formulation for DADP to remaining six ZIUs

The Morogoro ZIU staff now has adequate knowledge on method and process to train the district staff about irrigation scheme formulation for the DADP. It is thus recommended that the Morogoro ZIU should transfer his knowledge to the other six ZIUs, and then to all ZIU staff, thus qualifying them as trainers, and they should then train staff of other districts in their respective territorial areas.

- Introduction of a Certificate Issuance System

In order to enhance the effect of a training system by the ZIU to district offices and to act as an incentive to the district staff as well as ZIU staff, it is recommended that the ZIU, on behalf of the Director of DITS, should issue certificates to the relevant staff of the district after completion of training on irrigation scheme formulation for the DADP.

(c) Improvement of DADP Procedures

- Strengthening of O&OD Process

The O&OD process is effective as a bottom-up approach. It is therefore recommended that the DADP guidelines should further stress the application of the O&OD process and its budget arrangement.

-
- Proper Assessment of Village/Ward Plans by District Offices
Development schemes submitted by Village Governments through Ward Development Committees were very poor technically, economically, and environmentally. Thus, it is recommended that the DADP guidelines should indicate a more clear description of proper assessment of village/ward plans by district staff.
 - Precise Explanation on Harmonization of Top-Down and Bottom-up Approaches
The DADP guidelines mention that district offices shall function as mediators between those engaged in a top-down approach and those in a bottom-up approach. However, this description is not concrete, and could not be understood by district staff. It is therefore necessary that the DADP guidelines should attempt to find a better practical way that takes into consideration the actual situation of district offices.
 - Application of Similar Processes for Other Related Sub-sectors
To make fair selection of development schemes and to make sustainable irrigation development in harmonization with other sub-sectors, it is recommended that the other sub-sectors should apply similar processes to scheme formulation for the DADP.
 - Need of Selection Criteria for DADP
An adequate budget is indispensable for successful irrigation scheme formulation works under support of the ZIU. Thus, it is recommended that district offices should appropriate the necessary budget for those works, including operational cost of ZRC in the DADP.
 - Need of Budget Arrangement of Irrigation Scheme Formulation Work in DADP
To conduct successful irrigation scheme formulation works, district offices should appropriate the necessary budget for those works including operation cost of ZRC in the DADP.
- (d) Acceleration of Subsequent Stages of Irrigation Development
- Urgent Implementation of Irrigation Schemes Formulated for DADP
To fulfill the targeted irrigation development area and rice self-sufficiency proposed in the Master Plan Study, it is recommended that the selected irrigation schemes should be implemented under the DADP as planned.
 - Preparation of Practical Guidelines for Subsequent Development Stages
The MAFS keeps some guidelines and manuals for irrigation development. As
-

far as the lessons learned from the Verification Study were concerned, it is however, deemed that these guidelines and manuals are not suitable for district staff with little experience. It is therefore recommended that simple and practical guidelines/manuals for subsequent development stages should be prepared for district staff. In addition, it is recommended that the guidelines for operation and maintenance should contain the training programmes that will be prepared in cooperation with the relevant organizations like Kilimanjaro Agriculture Training Center (KATC).

- Collection of Basic Data for Irrigation Development

Reliable data and information are essential for successful irrigation development. The simple database system established at the DIMU of DITS, MAFS is helpful for the above. Thus, it is recommended that respective district offices should collect and send the basic data and information to the DIMU on time.

9 FEED BACK TO THE ACTION PLAN

(40) Modification of the Time Framework for Priority Programmes of the Subject-wise Improvement Programme

The time framework for the priority programmes was modified based on the results of the actual activities of the Verification Study. The Verification Study was commenced in January 2004, and completed in December 2004. In this connection, starting time of Code No.C7: Establishment of DADP Formulation Guideline for Irrigated Agriculture Development Programme and Code No.D3: Information and Database Improvement, were changed from July 2004 to January 2004. As for completion time, Code No.C7: Establishment of DADP Formulation Guideline for Irrigated Agriculture Development was modified to be in December 2005 since it will need to be disseminated to the remaining six zones for successful DADP formulation. Code No.D3: Information and Database Improvement was also changed to be completed in June 2005, and the remaining six months after completion of the Verification Study would be used for system management by the DIMU of DITS, and MAFS. All the remaining 16 priority programmes were rearranged to be started six months later in the original plan in consideration of the actual situations for implementation of the Action Plan.

-
- (41) Modification of Code No.C7: Establishment of DADP Formulation Guideline for Irrigated Agriculture Development Programme

The project proposal was partially modified based on the actual procedures utilized and lessons learned. Major modification points are (i) application of actual activities for irrigation scheme formulation by district staff using model districts, (ii) simple and practical guidelines considering the working experience and capability of district staff, (iii) clarification of roles and duties of the ZIU, (iv) preparation of guidelines in a participatory manner, and (v) clarification of procurement such as GPS units and leveling instruments. As for the Project Design Matrix, it was totally changed based on the actual procedures utilized and lessons learned.

- (42) Modification of Code No.D3: Information and Database Improvement

The project proposal was partially modified based on the actual procedures utilized and lessons learned. Major modification points are (i) application of a user-friendly concept, (ii) clarification of the composition of the database system, such as Irrigation Database and Irrigation GIS, (iii) clarification of functions of the Irrigation Database and Irrigation GIS, (iv) description of actual procedures for establishment of a database system, (v) application of actual system management by exchanging data with model districts, and (vi) description of the need for periodic updating of the database. As for the Project Design Matrix, it was totally changed based on the actual procedures utilized and lessons learned.

10 TECHNOLOGY TRANSFER

- (43) Overall Verification Study

Counterparts of DITS took part in both the VS-1 (database establishment) and VS-2 (irrigation scheme formulation) activities. The JICA Study Team explained the necessity and importance of linking both activities through job execution.

- (44) VS-1: Establishment of Simple Database and Information System

The JICA Study Team transferred to DIMU staff the following skills related to the Irrigation Database and the Irrigation GIS:

Transferred operation skills for the irrigation database:

- (a) Supply of pre-information to the district prior to their survey
- (b) Receiving of information from the district and input data into the database
- (c) Supply of annual irrigation development monitoring reports
- (d) Change of administrative boundaries in the irrigation database
- (e) Data input and inquiry data on reference documents

- (f) Data input and inquiry data on topographical maps

Transferred operational skill for the irrigation GIS:

- (a) Supply of pre-information to the district prior to their survey
- (b) Receiving of geographical information of the irrigation schemes and plotting them into the GIS
- (c) Supply of annual irrigation development monitoring reports
- (d) Change of administrative boundaries in the Irrigation GIS

(45) VS-2: Support for Irrigation Scheme Formulation for DADP

The JICA Study Team made the following technology transfer to DPDTs for two model districts.

Transferred technology for irrigation scheme formulation:

- (a) Preparatory works for field activities
- (b) Interview survey with well prepared questionnaire
- (c) Resource mapping
- (d) Simple soil texture test
- (e) Simple river discharge measurement
- (f) Simple water quality test
- (g) Simple GPS mapping
- (h) Simple water balance study
- (i) Scheme development planning and cost estimate
- (j) Incremental agricultural benefit estimate
- (k) Scheme evaluation
- (l) Selection of high priority irrigation schemes
- (m) Feedback workshop

11 VOICES OF COUNTERPARTS

After completion, the JICA Study Team listened to the counterparts' feedback regarding the training works and the irrigation development through questionnaires. Their major opinions are as follows:

(46) DITS of MAFS

- (a) In collaboration with the district staff, the DITS should follow-up to ensure that the targets set by the Master Plan Study are achieved.
- (b) ZIUs need to provide training for district offices.
- (c) More Training and technical assistance should be provided for the DIMU.

(47) DIMU of DITS of MAFS

- (a) The Training Kit used was helpful because it was a step-by-step training module, and its approach showed that it would also be useful for training for

the ZIU staff.

- (b) The training was very useful for irrigation development and future irrigation plans in Tanzania.
- (c) The database system is the most useful for the DITS by outputting present conditions and the latest development plan of the schemes.

(48) Mvomero District Office

- (a) The guidelines are necessary for other districts and that they should not overlook some of the steps in their work.
- (b) The time allotted for preliminary topographic surveys was not sufficient. The required time should be estimated considering the distance of the selected scheme.
- (c) Budget and transportation are constraints for irrigation development.

(49) Mkuranga District Office

- (a) The guidelines, since their modification, give adequate guidance for irrigation development for the DADP.
- (b) In the feedback workshop, the selected candidates were happy and thankful, and the candidates that were asked to wait for next year initially were unhappy, but finally they appreciated the situation. This feedback workshop was highly appreciated.
- (c) Constraints in future irrigation development are (i) lack of tools and equipment for preliminary surveying, (ii) lack of knowledge for water harvesting techniques, (iii) lack of transport and (iv) lack of funds.

(50) Morogoro ZIU

- (a) The guidelines are useful for other ZIUs.
- (b) As for training programmes for irrigation scheme formulation, the ZRC proposed holding (i) training seminars and (ii) study tours for training of the DPDT on irrigation scheme formulation. It will also include training on subsequent stages. It will enable the DPDT to manage irrigation development in totality.
- (c) ZRC has difficulty in endorsement and validation work as the DPDT selected a new development scheme that had a lower priority in the Agriculture Policy.
- (d) ZRC in Morogoro should be given everything they need to carry out training programmes on scheme formulation in other ZIUs.

12 SEMINAR FOR VERIFICATION STUDY

(51) Objective

The staff of DITS, Morogoro Zonal Irrigation Unit, Mvomero District and Mkuranga District obtained much experience through participation in the Verification Study with the JICA Study Team. The aim of the seminar was to disseminate their experiences to the staff of other districts under the territory of the Morogoro Zonal Irrigation Unit.

(52) Outline of the Seminar

The seminar was conducted over the 28th and 29th of September, 2004 at Dar es Salaam. On the 28th, the seminar dealt mainly with the database and information system. The presentations were made by the DITS staff of MAFS. On the 29th, the seminar focused on irrigation scheme formulation activities and was presented by the staff of Morogoro ZIU, Mvomero District and Mkuranga District. In the presentation of the Morogoro ZIU staff, the process of irrigation scheme formulation was stressed. On the other hand, the Mvomero and Mkuranga staff emphasized the lessons learned from the irrigation scheme formulation process.

(53) Impression of the Seminar

In the seminar, all the presenters gave nice explanations on their themes. In response to these presentations, the participants actively contributed to the seminar with valuable comments. After fruitful discussion, most of the participants acknowledged that the seminar was significant in helping them understand the Verification Study, the database system established by the Study, and the irrigation scheme formulation process developed in the Verification Study. It was recognized that this improved understanding would contribute greatly to smooth irrigation development.

**THE STUDY
ON
THE NATIONAL IRRIGATION MASTER PLAN
IN
THE UNITED REPUBLIC OF TANZANIA**

VERIFICATION STUDY REPORT

Table of Contents

LOCATION MAP

PHOTOS

SUMMARY

ABBREVIATIONS AND MEASUREMENT UNITS

	<u>Page</u>
Chapter 1 INTRODUCTION	1-1
1.1 Authority	1-1
1.2 Report Composition	1-1
1.3 General Work Flow for Study on the National Irrigation Master Plan	1-1
1.4 Steering Committee Meetings and Stakeholder Meetings	1-3
Chapter 2 OUTLINE OF THE MASTER PLAN STUDY	2-1
2.1 General	2-1
2.2 National Socio-economic Conditions and Development Policies.....	2-1
2.2.1 Overview of Macro-economic Performance	2-1
2.2.2 National Development Policies	2-1
2.2.3 Current Economic Situations and Socio-economic Setting	2-2
2.3 Sectoral Development Policies and Economic Conditions	2-2
2.3.1 Sectoral Development Policies	2-2
2.3.2 Sectoral Economic Analysis	2-2
2.4 Background and Constraints in Irrigation Development.....	2-3
2.4.1 Natural Conditions	2-3
2.4.2 National Irrigation Development Plan (NIDP)	2-3
2.4.3 New Water Policy	2-3
2.4.4 Land Use.....	2-4
2.4.5 Farming System	2-4
2.4.6 Marketing	2-4
2.4.7 Institution.....	2-5
2.4.8 Organizations	2-5

	<u>Page</u>
2.4.9	Study on Irrigation Development Level.....2-6
2.4.10	Environment2-6
2.5	Inventory Survey and PCM Workshops2-7
2.5.1	Inventory Survey for Irrigation Schemes2-7
2.5.2	Problem Analysis on Specific Fields2-7
2.5.3	PCM Workshops2-8
2.6	Potential Area of Irrigation Development2-8
2.6.1	Water Resources Potential.....2-8
2.6.2	Land Resources Potential2-9
2.6.3	Socio-economic Potential2-10
2.6.4	Identification of Irrigation Development Potential Area2-11
2.7	Framework for Irrigation Development2-11
2.7.1	Need of Irrigation Development.....2-11
2.7.2	Objective and Strategies of National Irrigation Master Plan2-12
2.7.3	Framework for National Irrigation Master Plan2-14
2.7.4	Basic Plan for Irrigation Development Level.....2-15
2.7.5	Basic Plan for Institutional Development2-16
2.7.6	Basic Plan for Agricultural Development2-16
2.7.7	Priority Grouping of Inventorized Irrigation Schemes.....2-17
2.7.8	Alternative Study for Development Target2-18
2.8	Irrigation Development Programme.....2-20
2.8.1	Development Scenario for the Year 2017.....2-20
2.8.2	Subject-wise Improvement Programme2-20
2.8.3	Scheme-wise Development Programme2-21
2.8.4	Cost Estimate for NIMP Implementation.....2-21
2.9	Conclusions and Recommendations.....2-22
2.9.1	Conclusions2-22
2.9.2	Recommendations2-23
Chapter 3	OUTLINE OF THE ACTION PLAN STUDY3-1
3.1	General3-1
3.2	Basic Approach to the Action Plan.....3-1
3.2.1	Objectives3-1
3.2.2	Basic Concept.....3-1
3.2.3	Selection of Model Irrigation Schemes3-2
3.3	Analysis on Model Irrigation Schemes and Selection of Priority Programmes...3-3
3.3.1	Problem Tree and Objective Tree3-3

	<u>Page</u>
3.3.2	Linkage of Identified Issues from Field Survey and Subject-wise Improvement Programme3-3
3.3.3	Selection of Priority Programmes3-5
3.4	Special Study on Major Issues Identified in Problem Analysis3-5
3.4.1	Scheme Implementation Process.....3-5
3.4.2	Irrigators' Association3-6
3.4.3	Farmers' Participation and Bottom-up Approach.....3-7
3.4.4	Agricultural Inputs Supply and Marketing of Farm Products.....3-8
3.4.5	Environmental Consideration.....3-8
3.4.6	Irrigation Regulations.....3-9
3.5	Action Plans for Priority Programmes and Model Irrigation Schemes.....3-9
3.5.1	Priority Programmes of Subject-wise Improvement Programme3-9
3.5.2	Model Irrigation Schemes of Scheme-wise Development Programme3-11
3.5.3	Time Framework3-14
3.6	Recommendations3-15
Chapter 4	GENERAL INFORMATION FOR THE VERIFICATION STUDY4-1
4.1	Bottleneck Problems Identified for the Verification Study4-1
4.2	Objectives of the Study4-2
4.3	The Study Area.....4-3
4.4	Overall Schedule of the Verification Study4-3
4.5	Actual Situation before Starting the Verification Study4-4
4.5.1	Data and Information Management at DITS4-4
4.5.2	Irrigation Scheme Formulation for DADPs in Two Model Districts4-5
Chapter 5	ACTIVITIES FOR THE VERIFICATION STUDY5-1
5.1	Framework of the Verification Study5-1
5.2	Basic Approaches to the Verification Study5-4
5.2.1	Linkage with Guidelines and Database System5-4
5.2.2	Participatory Approach to Guidelines and Database System Preparation.....5-5
5.2.3	Introduction of User-friendly Guidelines and Database System.....5-5
5.2.4	Preparation of Guidelines Using Data and Information Collected in the Master Plan and the Action Plan Studies.....5-6
5.2.5	Efficacious Transfer of Data, Information and Technologies Used in the Master Plan and the Action Plan Studies to DITS through Database System.....5-6
5.2.6	Application of Systematic On-the-job Training5-7

	<u>Page</u>
5.3	Inputs to the Verification Study5-7
5.3.1	Establishment of Simple Database and Information System5-7
5.3.2	Support for Irrigation Scheme Formulation for DADP.....5-7
5.4	Activities of the JICA Study Team5-8
5.4.1	Establishment of Simple Database and Information System5-8
5.4.2	Support for Irrigation Scheme Formulation for DADP.....5-14
5.4.3	Verification of the Hypothesis of the Study5-17
5.5	Activities of Counterparts5-18
5.5.1	Establishment of Simple Database and Information System5-18
5.5.2	Support for Irrigation Scheme Formulation for DADP.....5-18
5.6	Activities of the NGO.....5-19
Chapter 6	RESULTS OF THE VERIFICATION STUDY.....6-1
6.1	Products of the JICA Study Team.....6-1
6.1.1	Simple Database and Information System6-1
6.1.2	Guidelines for Irrigation Scheme Formulation for DADP.....6-22
6.2	Effect of Training6-31
6.2.1	Establishment of Simple Database and Information System6-31
6.2.2	Support for Irrigation Scheme Formulation for DADP.....6-33
6.3	Outcome of Counterparts6-36
6.3.1	Data and Information Management with Actual Data.....6-36
6.3.2	Irrigation Scheme Formulation for DADP.....6-38
6.4	Results of the Verification6-42
6.4.1	Establishment of Simple Database and Information System6-42
6.4.2	Support for Irrigation Scheme Formulation for DADP.....6-43
Chapter 7	LESSONS LEARNED FROM THE VERIFICATION STUDY7-1
7.1	Important Notice on the Use of Guidelines.....7-1
7.2	Unforeseen Benefits of Activities for the Verification Study.....7-1
7.2.1	Process of Data and Information Management7-1
7.2.2	Process of Irrigation Scheme Formulation.....7-2
7.2.3	Process of the Verification.....7-5
7.3	Procedures for DADP Preparation7-5
7.3.1	Difficulty in Irrigation Scheme Formulation without an O&OD Process.....7-5
7.3.2	Need for Overall Justifications of the Village Proposed Plan7-6
7.3.3	Anticipation of Proper Planning for Other Agricultural Sub-sectors7-6

	<u>Page</u>
7.3.4	Need for Prioritization Criteria for Agricultural Sub-sectors' Development 7-6
7.3.5	Need for Concrete Guidelines to Avoid Conflict of Prioritization between National and District Levels 7-7
7.4	Subsequent Irrigation Development Stages..... 7-7
7.4.1	Need for Technical Support..... 7-7
7.4.2	Need for Collection of Basic Data 7-7
Chapter 8	CONCLUSION AND RECOMMENDATIONS 8-1
8.1	Conclusion..... 8-1
8.2	Recommendations 8-1
8.2.1	Distribution of Guidelines for Irrigation Scheme Formulation to District Offices 8-1
8.2.2	Ensuring Sustainability of the Verification Study Effect..... 8-2
8.2.3	Improvement of DADP Procedures..... 8-3
8.2.4	Acceleration of Subsequent Stages of Irrigation Development 8-4
Chapter 9	FEEDBACK TO THE ACTION PLAN 9-1
9.1	General 9-1
9.2	Modification of Time Framework for Priority Programmes of Subject-wise Improvement Programme..... 9-1
9.3	Code No.C7: Establishment of DADP Formulation Guideline for Irrigated Agriculture Development Programme (Modified)..... 9-3
9.4	Code No.D3: Information and Database Improvement (Modified)..... 9-8
Chapter 10	TECHNOLOGY TRANSFER..... 10-1
10.1	Overall Verification Study 10-1
10.1.1	List of Counterparts Attended the Training Programme 10-1
10.1.2	Technology Transferred..... 10-1
10.2	Irrigation Database and GIS Operation 10-1
10.2.1	List of Counterparts Attended the Training Programme 10-1
10.2.2	Technology Transferred..... 10-1
10.3	Irrigation Scheme Formulation for DADP 10-2
10.3.1	List of Counterparts Attended the Training Programme 10-2
10.3.2	Technology Transferred..... 10-3
Chapter 11	VOICES OF COUNTERPARTS 11-1
11.1	DITS of MAFS 11-1
11.1.1	Opinion regarding the Verification Study..... 11-1

	<u>Page</u>
11.2	DIMU of DITS 11-3
11.2.1	Products and Training of the JICA Study Team 11-3
11.2.2	Data and Information Management in the Future 11-4
11.3	Mvomero District Office 11-6
11.3.1	Products and Training of the JICA Study Team 11-6
11.3.2	Findings in the Process of Irrigation Scheme Formulation..... 11-6
11.3.3	Irrigation Scheme Formulation in the Future 11-9
11.4	Mkuranga District Office 11-10
11.4.1	Products and Training of the JICA Study Team 11-10
11.4.2	Findings in the Process of Irrigation Scheme Formulation..... 11-11
11.4.3	Irrigation Scheme Formulation in the Future 11-15
11.5	Morogoro ZIU 11-16
11.5.1	Products and Training of the JICA Study Team 11-16
11.5.2	Findings in the Process of Irrigation Scheme Formulation..... 11-17
11.5.3	Technical Support to Districts in the Future..... 11-19
Chapter 12	SEMINAR FOR THE VERIFICATION STUDY 12-1
12.1	Objective 12-1
12.2	Schedules and Presenters..... 12-1
12.3	Participants 12-2
12.4	Outline of the Seminar 12-2
12.5	Major Discussions at the Seminar 12-3
12.6	Impressions of the Seminar 12-3

Attachments

	<u>Page</u>
Attachment-1	Scope of Work AT1-1
Attachment-2	Minutes of Meeting for the Study on the National Irrigation Master Plan AT2-1
Attachment-3	Minutes of Meeting on Inception Report AT3-1
Attachment-4	Minutes of Meeting on Progress Report 1 AT4-1
Attachment-5	Minutes of Meeting on Draft Master Plan Report..... AT5-1
Attachment-6	Minutes of Meeting on Inception Report 2 AT6-1
Attachment-7	Minutes of Meeting on Draft Action Plan Report AT7-1
Attachment-8	Minutes of Meeting on Inception Report 3 AT8-1

	<u>Page</u>
Attachment-9	Minutes of Meeting on Draft Guidelines.....AT9-1
Attachment-10	Minutes of Meeting on Progress Report 3.....AT10-1
Attachment-11	Minutes of Meeting on Draft Verification Study Report.....AT11-1
Attachment-12	Detailed Explanation of Rectification WorksAT12-1

ABBREVIATIONS

AGITF	Agricultural Input Trust Fund
ASDP	Agricultural Sector Development Programme
ASDS	Agricultural Sector Development Strategy
ASPS	Agricultural Sector Programme Support
DADP	District Agricultural Development Plan
DALDO	District Agriculture and Livestock Development Officer
DIMU	Data and Information Management Unit
DITS	Division of Irrigation and Technical Services
DPDT	District Project Development Team
EIA	Environmental Impact Assessment
IA	Irrigators' Association
IRR	Internal Rate of Return
GDP	Gross Domestic Product
GIS	Geographic Information System
GOT	Government of Tanzania
HIV/AIDS	Human Immunodeficiency Virus /Acquired Immuno-Deficiency Syndrome
IA	Irrigators Association
JICA	Japan International Cooperation Agency
KATC	Kilimanjaro Agriculture Training Center
LGA	Local Government Authority
LGRP	Local Government Reform Programme
MAFS	Ministry of Agriculture and Food Security
MANREC	Ministry of Agriculture, Natural Resources, Environment and Cooperatives
MCM	Ministry of Cooperative and Marketing
MCT	Ministry of Communication and Transportation
MDC/AMSDP	Market Development Center/ Agricultural Marketing Systems Development Programme
MLHS	Ministry of Land and Human Settlements
MOF	Ministry of Finance
MWLD	Ministry of Water and Livestock Development
NAFCO	National Agricultural and Food Corporation
NGO	Non-Governmental Organization
NIDP	National Irrigation Development Plan
NIMP	National Irrigation Master Plan
NPES	National Poverty Eradication Strategy
O&M	Operation and Maintenance
O&OD	Opportunity and Obstacles to Development
PCM	Project Cycle Management
PDM	Project Design Matrix
PO-PC	President's Office-Planning Commission
PO-RALG	President's Office-Regional Administration and Local Government

PPP	Public Private Partnership
PRSP	Poverty Reduction Strategy Paper
RBMSIIP	River Basin Management and Smallholder Irrigation Improvement Project
RDS	Rural Development Strategy
RRA	Rapid Rural Appraisal
SMS	Subject Matter Specialist
SACCOS	Savings and Credit Cooperatives
TAS	Tanzania Assistant Strategy
UTM	Universal Transverse Mercator Metric Grid
URL	Uniform Resource Locator
VLP	Village Level Planning Cycle
ZIU	Zonal Irrigation Unit
ZRC	Zonal Review Committee

MEASUREMENT UNITS

Extent

cm² = Square-centimeters (1.0 cm x 1.0 cm)

m² = Square-meters (1.0 m x 1.0 m)

km² = Square-kilometers (1.0 km x 1.0 km)

a = Are (100 m² or 0.01 ha.)

ha = Hectares (10,000 m²)

ac = Acres (4,046.8 m² or 0.40468 ha.)

Volume

cm³ = Cubic-centimeters
(1.0 cm x 1.0 cm x 1.0 cm
or 1.0 m-lit.)

m³ = Cubic-meters
(1.0 m x 1.0 m x 1.0 m
or 1.0 k-lit.)

lit 1 = Liter (1,000 cm³)

MCM = Million Cubic Meter

Length

mm = Millimeters

cm = Centimeters (cm = 10 mm)

m = Meters (m = 100 cm)

km = Kilometers (km = 1,000 m)

Weight

gr = Grams

kg = Kilograms (1,000 gr.)

ton = Metric ton (1,000 kg)

Currency

US\$ 1.0 = ¥ 104.2 = Tsh 1,055.0

(as of November, 2004)

US\$ = United State Dollars

¥ = Japanese Yen

Tsh = Tanzanian Shillings

Time

sec = Seconds

min = Minutes (60 sec.)

hr = Hours (60 min.)

Chapter 1

Introduction



Stakeholder meeting for the Master Plan Study held in Dar es Salaam

THE STUDY
ON
THE NATIONAL IRRIGATION MASTER PLAN
IN THE UNITED REPUBLIC OF TANZANIA

VERIFICATION STUDY REPORT
MAIN REPORT

CHAPTER 1 INTRODUCTION

1.1 Authority

This Verification Study Report (the Report) was prepared in accordance with the Scope of Work for the Study on the National Irrigation Master Plan in the United Republic of Tanzania (the Study) agreed between the Ministry of Agriculture and Food Security, the United Republic of Tanzania (MAFS) and the Japan International Cooperation Agency (JICA) on April 10, 2001(Attachments-1 and -2).

1.2 Report Composition

This report presents not only the results of the Verification Study, but also the outline of the Master Plan Study and the Action Plan Study, to clarify the relationships among them. The results of the Verification Study are given in Chapter 4 to Chapter 12.

1.3 General Work Flow for the Study on National Irrigation Master Plan

The Study on the National Irrigation Master Plan was conducted in three phases, namely, Phase 1: Master Plan Study, Phase 2: Action Plan Study and Phase 3: Verification Study.

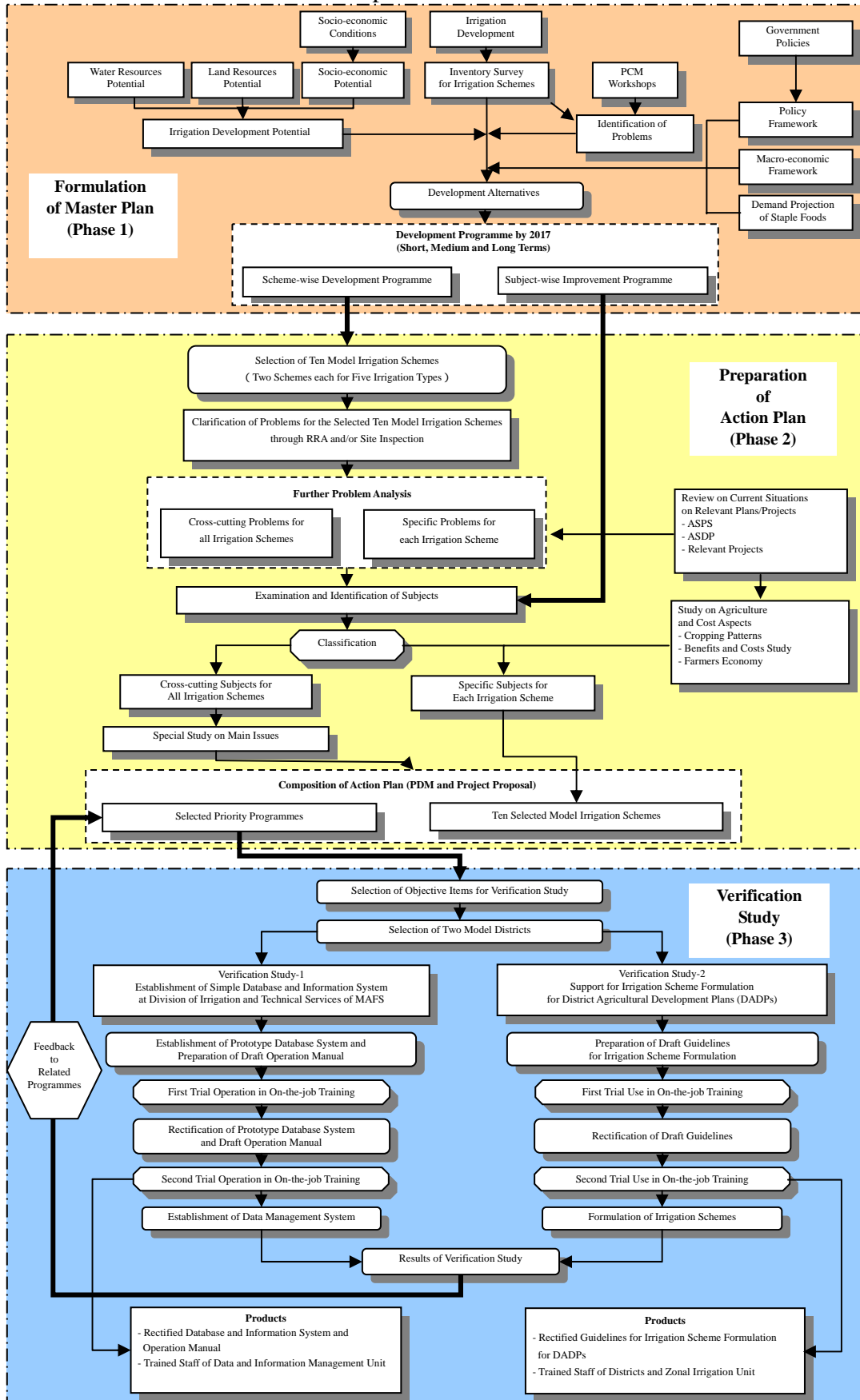
In Phase 1, irrigation development potential was identified from the viewpoints of water resources potential, land resources potential and socio-economic potential. Problems against smooth irrigation development were also clarified through inventory survey and Project Cycle Management (PCM) workshops, and then various subjects were extracted. A development programme forward to 2017, consisting of a Scheme-wise Development Programme and Subject-wise Improvement Programme, was prepared for the short, medium and long terms through the development alternative study.

In Phase 2, ten model irrigation schemes were selected from the Scheme-wise Development Programme. Site inspection and Rapid Rural Appraisal were conducted for five schemes each to confirm the Subject-wise Improvement Programme proposed in the Master Plan Study. An Action Plan was prepared for the ten model irrigation schemes and the selected priority programmes from the Subject-wise Improvement Programme.

In Phase 3, the Verification Study was made for bottleneck problems for

successful irrigation development, which were identified from the selected priority programmes as the results of the Master Plan Study and Action Plan Study.

General work flow for these three phases is shown below.



1.4 Steering Committee Meetings and Stakeholder Meetings

In the Master Plan, the Action Plan and the Verification Studies, eight Steering Committee Meetings were held as follows:

Executed Steering Committee Meetings in Study Period

Theme	Date	Reference
(1) Master Plan Study		
Inception Report	November 6 2001	Attachment-3
Progress Report 1	January 24, 2002	Attachment-4
Draft Master Plan Report	August 29, 2002	Attachment-5
(2) Action Plan Report		
Inception Report 2	December 17, 2002	Attachment-6
Draft Action Plan Report	August 4, 2003	Attachment-7
(3) Verification Study		
Inception Report 3	January 14, 2004	Attachment-8
Draft Guidelines	March 3, 2004	Attachment-9
Progress Report 3	August 5, 2004	Attachment-10
Draft Verification Study Report	September 27,2004	Attachment-11

In these meetings, the submitted reports were, in principle, accepted by the committee as mentioned in the minutes of meetings (Attachments-3 to 10). In addition, five Stakeholder Meetings were held by the MAFS in cooperation with the JICA Study Team. In the meetings, various opinions were exchanged among stakeholders. Those opinions were referred to procedures and contents of the series of studies.

Chapter 2

Outline of the Master Plan Study



Meeting with counterparts, DITS of MAFS

CHAPTER 2 OUTLINE OF THE MASTER PLAN STUDY

2.1 General

This chapter presents the outline of the Master Plan Study conducted from November 2001 to November 2002. The Master Plan Study contains the framework of irrigation development, development scenario and programme up to the Year 2017, and basic plans of institutional development and agricultural development. In particular, the Master Plan was composed of two pillars, say the Subject-wise Improvement Programme and Scheme-wise Development Programme from viewpoints of well harmonization of software aspects and hardware aspects, to realize sustainable irrigation development. The results were compiled in the form of a “Master Plan, November 2002”.

2.2 National Socio-economic Conditions and Development Policies

2.2.1 Overview of Macro-economic Performance

The GDP growth rate jumped from 1.4 % in 1994 to 3.6 % the following year. It remained above 3 % up to 2000 except for a sharp decline to 0.9% in 1997 mainly due to severe weather conditions. The GDP growth rate is expected to rise to 5.9 % in 2002, 6.3 % in 2003 and 7 % in 2004.

2.2.2 National Development Policies

After preparation of the NIDP in 1994, the government issued the following six major policies:

Relevant National Development Policies

Policies	Major Objectives Related to Agriculture/Irrigation Development
Tanzania Development Vision 2025 in 2000	Food self-sufficiency and food security are articulated as top goal of the first attribute, high quality livelihood.
Tanzania Assistant Strategy (TAS) in 2000	Management of external resources to achieve the development strategies.
National Poverty Eradication Strategy (NPES) in 1998	Encouragement of increased investment in smallholder irrigation systems.
Poverty Reduction Strategy Paper (PRSP) in 2000	Development of irrigated farming by communities under support of the government.
Decentralization Policy	Completion of decentralization by 2011.
Rural Development Strategy (RDS) in 2001	Promotion of profitable irrigation infrastructure.

2.2.3 Current Economic Situations and Socio-economic Setting

The government has targeted several key areas in which strategic actions will be required to create conditions favorable for higher economic growth, focusing on poverty reduction. Agriculture is the largest employer, mostly through self-employment on smallholdings with women between 15 and 59 years old contributing 63% of the agricultural labor supply. Thus the agricultural development, including irrigation, must include the involvement of women. Tanzania faces a chronic food deficit and a food self-sufficiency rate subject to frequent fluctuations. These are more pronounced in the drought years when many regions experience food deficit. Poverty is pervasive throughout the Mainland with about 36 % of total population falling below the basic needs poverty line and 19 % below the food poverty line in 2000/01. Rural areas have the highest population and greater poverty: 20 % in food poverty and 39 % in basic needs poverty, reflecting a wide gap of poverty incidence between urban and rural.

2.3 Sectoral Development Policies and Economic Conditions

2.3.1 Sectoral Development Policies

The “Agricultural Sector Development Strategy”, and the “Agricultural Sector Development Programme” are super-ordinate plans to irrigation development. Their major points related to irrigation development are as follows:

Sectoral Development Policies

Policies	Major Points Related to Irrigation Development
Agricultural Sector Development Strategy (ASDS)	Encouragement of farmers towards integrated soil and water management by sub-soiling water harvesting, and use of appropriate husbandry practices to promote optimum use of water resources. Formulation of National Irrigation Master Plan.
Agricultural Sector Development Programme (ASDP)	Reduction of over-dependence on rainfed agriculture through rehabilitation and management of low-cost smallholder irrigation schemes including rainwater harvesting, to reduce fluctuation in production...

2.3.2 Sectoral Economic Analysis

Tanzania’s economy is heavily dependent on agriculture, which accounts for 48 % of its GDP, and provides 65 % of its foreign exchange earnings. In spite of such large contribution to the country’s economy, the share of expenditure to the agricultural sector was only 2.6 % of the total government expenditure in 2000/01. The average share of irrigation development for five years of 1998/99 to 2002/03 is only 1.46 % of Government of Tanzania (GOT) Development Expenditure.

2.4 Background and Constraints in Irrigation Development

2.4.1 Natural Conditions

Tanzania has a territorial area of approximately 94.8 million ha and a cultivated area in the Mainland estimated at 10 million ha. Tanzania mostly lies on the Great African Plateau with altitudes ranging between 1,000 m and 2,000 m above mean sea level. Most regions receive rain from December to April referred to as the “wet season”. The “dry season” is generally during the months of June to October. Annual rainfall varies from 500 mm to 1,000 mm over most of the country with highest rainfall of 1,000 mm to 3,000 mm in the north-east of Lake Tanganyika basin and in the Southern Highlands. Mean temperatures range from 26 °C on the coast to 17 °C in the Southern Highlands.

2.4.2 National Irrigation Development Plan (NIDP)

(a) Philosophy and Composition of NIDP

The NIDP was prepared in 1994 to contribute toward attaining food security at all levels. The NIDP proposed five components under the sub-objectives of “Removal of the Sectoral Constraints” and “Implementation of Irrigation Infrastructure”, which would be completed by 2014.

(b) Progress of Implementation of NIDP

The NIDP has not made adequate progress since 1995. About 70 % of the components for the “Removal of the Sectoral Constraints” have not yet been set up, and the 30% which have commenced are far from the expected targets. In regard to the “Implementation of Irrigation Infrastructure”, only about 30 % of the prioritized schemes have been completed or committed so far. The main reasons for the unexpected lack of progress of the NIDP are inadequate institutional building, lack of human and financial resources.

2.4.3 New Water Policy

The National Water Policy, which is due to be authorized shortly, states that “water uses will be subject to social, economic and environmental criteria”, and “every water use permit shall be issued for a specific duration”. These two requirements bring great threats for irrigation water supply. One is that new irrigation water resources development will compete with industrial sectors and will be restrained from the viewpoint of economic superiority. The other threat is that continuous irrigation water supply will be hindered due to conditions imposed on the right holder or the needs of new water users.

2.4.4 Land Use

(a) Present Land Use

The present land use is categorized into eight land types; forests, woodland, bushland, grassland, cultivated land, open land, water body and others. The cultivated land occupies about 10% of the total land area (about 10 million ha). The main food crops grown in the country are maize, sorghum, millet, paddy, wheat, sweet potato, cassava, pulses and bananas. Of these, maize is the dominant crop with a planted area of over 1.5 million ha during recent years, and the planted area of paddy increasing from less than 400,000 ha to more than 500,000 ha over the past few years. Considerable parts of the land area are allocated for paddy in Morogoro, Tabora, Mwanza and Mbeya. The average planted area per holding is 1.76 ha ranging from 0.94 ha in Kigoma to 3.00 ha in Shinyanga.

(b) Land Tenure

Uncertainty and insecurity of land tenure for many rural households are causes of their reluctance to invest in land improvements. The reform of the land tenure system and land use legislation is needed in order to minimize the land use conflict and the degradation of land resources.

(c) Land Resources for Irrigation Development

About 33 % of cultivated land is actually utilized for crop production as planted land. Only 6 % of the planted land, which is equivalent to about 200,000 ha, is being irrigated. The total irrigation potential is so far estimated as one million ha. This estimate was also confirmed by the results of the inventory survey and of the preliminary estimate on potential area for large-scale irrigation schemes in the study.

2.4.5 Farming System

Small-scale subsistence farming is dominant in the Mainland. The majority of farmers rely on hand hoes as main cultivating tools, though a small percentage use tractors and draft animals. The main weakness in present cropping is the heavy reliance on rainfed agriculture and the major constraints on farm management are late transplanting, low plant density, poor weeding and low inputs.

2.4.6 Marketing

The distribution of the selected food crops from producers to final consumers follow a multi-channel structure ranging from direct marketing to intensive distribution involving several intermediaries. Domestic trade is mostly undertaken directly between traders and producers. The physical exchange process in the

marketing of the major cereals in rural areas takes place mainly through periodic food market fairs. Transportation of the major cereals and non-cereals in the country is made by various means such as human couriers, bicycles, pickup trucks, buses, and heavy-duty lorries. Prices of all food crops depend on the supply-demand situation and for many of the foodstuffs they fluctuate considerably according to seasons of the year. Major constraints in marketing are the unregulated market, the underdeveloped transportation infrastructure, poor storage facilities, and absence of market information and promotion.

2.4.7 Institution

The role of the government in agricultural policy has been changing from being an active participant to being a facilitator, playing a regulatory role and providing support services and technical backup. Instead of the governments' strong intervention, the participatory approach of all stakeholders in the agricultural development has been emphasized. Consequently, farmers and other private sectors are now expected and encouraged to play a much greater part in all stages of agricultural development including irrigation development. A number of institutional constraints facing irrigation development were identified in the NIDP. They essentially stemmed from various factors and their complex interactions. However, the overall institutional setting for irrigation development has been unfortunately considered as one of major causes for the poor performance of irrigation in the past.

2.4.8 Organizations

Organizations related to irrigation development are the central government, the local government, the private sectors, NGOs, and local villages. In the central governmental body, there is no one organization holding all necessary mandates for irrigation development. The major participants at the central level include the President's Office-Planning Commission (PO-PC), President's Office-Regional Administration and Local Government (PO-RALG), Ministry of Finance (MOF), MAFS, Ministry of Water and Livestock Development (MWLD), Ministry of Land and Human Settlements (MLHS), and Ministry of Cooperative and Marketing (MCM). Coordination mechanisms for the relevant organizations are necessary, but no comprehensive system has yet been established. The Irrigation Section¹ is at present one of five sections belonging to the Crop Development Division in the MAFS. Considering the importance of irrigation development for

¹ : Thereafter, the Irrigation Section was promoted to the Division of Irrigation and Technical Services on November 19, 2002.

economic development and poverty alleviation in the rural areas, the present institutional position in irrigation development unfortunately seems inappropriate to coordinate and harmonize the different organizations involved in irrigation development, and furthermore, is unable to make prompt decisions.

2.4.9 Study on Irrigation Development Level

Discrepancies in irrigation development level may bring about; (i) ineffective utilization of limited resources available for irrigation development, (ii) complaints from farmers about the irrigation schemes being in depleted level, (iii) confusion in expansion of model effects to other areas, and (iv) complexity in supervising and monitoring irrigation schemes together with others which are under different development levels. Existing technical references hardly mention the different irrigation development levels. In Tanzania, irrigation development should be promoted in various manners corresponding to the requirements of each site. Pursuing optimum irrigation development for each target area according to its constraints and locality requires different irrigation development levels.

2.4.10 Environment

The Mainland faces serious environmental problems in the existing schemes. The identified environmental problems are as follows:

Negative and Positive Impacts

Negative Impacts	Positive Impacts
Overuse of water by upstream beneficiaries to detriment of downstream beneficiaries, leading to loss of income and quality of life for downstream beneficiaries and finally accelerating over grazing and wide spread land degradation.	Creation of cattle' grazing during periods when there are not many alternatives using end points of drains.
Overuse of water leading to falling replenishment of groundwater reserves.	Creation of an incentive for highly beneficial soil and water conservation practices through irrigation.
Local flooding due to poor water control /management.	Reduction of damage to downstream and upstream cultivation areas, health risks associated with flooding and soil erosion by flood alleviation.
Soil erosion leading to loss of soil cover.	-
Water logging and salinity in vulnerable soils leading to poor agricultural production.	-
Water-born diseases such as Bilharzia and Malaria.	-
Increased use of fertilizer and pesticides resulting in negative impact to environment.	-
Deforestation for reclamation of new farming land.	-

Source: JICA Study Team

2.5 Inventory Survey and PCM Workshops

2.5.1 Inventory Survey for Irrigation Schemes

(a) Objective and Scope

The inventory survey of the irrigation schemes was carried out to grasp the present situation and proposed plan of irrigation schemes including location, history, irrigation and drainage, agriculture and land use, farmers' supporting systems, farmers' organizations, operation and maintenance, and the environment. The inventorized schemes are 1,428 in total, covering 854,300 ha as follows:

Inventorized Schemes

Data Source	Nos. of Schemes	Estimated Irrigation Area (ha)
Inventory Survey by the NIMP	689	616,700
Inventory Survey by the RBMSIIP	739	237,600
Total	1,428	854,300

Source: Inventory survey conducted by the NIMP and RBMSIIP

(b) Classification of Inventorized Schemes

The inventorized irrigation schemes are classified into the following irrigation types defined in the study on Regional Irrigation Development Strategy:

Inventorized Schemes by Type of Irrigation

Type of Irrigation	Nos. of Schemes	Existing Area (ha)	Estimated Irrigation Area (ha)
Existing Schemes	1,189	191,900	670,400
Traditional Irrigation	982	122,600	518,700
Water Harvesting	42	7,900	27,600
Modern Irrigation	52	35,900	73,800
Improved Traditional Irrigation	113	25,500	50,300
Newly Proposed Schemes	239	-	183,900
Water Harvesting	163	-	123,100
Modern Irrigation	76	-	60,800
Total	1,428	191,900	854,300

Source: Inventory survey conducted by NIMP and RBMSIIP

2.5.2 Problem Analysis on Specific Fields

Problems found in the fields of agriculture, irrigation schemes and institution and organization are as follows:

Agriculture	Irrigation Schemes	Institution and Organization
- Low crop yield and unstable production due to over-dependence on rainfed agriculture	- Inadequate farmers' participation	- Low autonomy and inadequate coordination of Irrigation Section
- Insufficient investment in land improvement due to uncertainty and insecurity of land tenure	- Poor logical structure for project planning	- Unclear demarcation of responsibilities for extension services between Irrigation Section and Local Governments
- Rudimentary farming system mostly depending on hand	- Insufficient capability of Irrigation Section on appropriate project planning	- Lack of institutional guaranteed tenure and institutional mechanism to mediate water conflicts
	- No feedback system	- No comprehensive mechanism
	- No practical guidelines or manuals on implementation	

hoes - High rates of soil degradation due to reduced fallow period	- Poor capability of local consultants and contractors - Poor supporting system to WUAs - Low capability of local government staff in irrigation development	among major participants - Lack of a legal mandate, technical skills and facilities to enforce some roles - Lack of expertise for strategic and financial planning & management - Very limited resources for local level institutional building for community participation in development process - A shortage of competent personnel and technical equipment to manage and control development process
---	--	--

2.5.3 PCM Workshops

Through the five PCM workshops involving different participant groups, the core problems identified were (i) ineffective performance of the Irrigation Section, (ii) poor support to irrigation farming by the LGAs, (iii) water scarcity on farm plots, and (iv) poor development of irrigation farming. At least two hidden core problems could be extracted from these separately identified problems which related to insufficient ownership and insufficient capability in institution, technology and finance. These problems have been analyzed, and the obtained secondary causes have been classified into five categories: financial, technical, social, organizational/institutional, and environmental issues, to aid the identification of appropriate countermeasures.

2.6 Potential Area of Irrigation Development

2.6.1 Water Resources Potential

(a) Hydrological Environment

Tanzania is hydrologically divided into nine river drainage basins. These are (i) Pangani River Basin, (ii) Ruvu/Wami River Basin, (iii) Rufiji River Basin, (iv) Ruvuma River and the Southern Coast Basin, (v) Lake Nyasa Basin, (vi) Internal Drainage Basin, (vii) Lake Rukwa Basin, (viii) Lake Tanganyika Basin, and (ix) Lake Victoria Basin. The surface river regime corresponds to the rainfall pattern. The hydrological year starts in October/November and ends in September/October.

(b) Method of Assessment of Water Resources Potential

Assessment of water resources potential is based on both surface water and groundwater. For the availability of surface water, consideration was given to two characteristics: quantitative availability and flow regime. Quantitative availability is determined by preparing a distribution map of specific run-off for the entire

country. Characteristics of flow regime can be determined by means of flow duration curves, and also an indicator of Base Flow Index.

(c) Flow Regime

The flow duration curves are classified into three groups in the Study; Group A ($Q_1(95)>0$), Group B ($Q_1(65)>0, Q_1(95)=0$) and Group C ($Q_1(65)=0$). Each group has different characteristics in flow regime and in method of water use. The Group A ($Q_1(95)>0$) is a perennial river for which stable and constant water abstraction is possible. The Group C ($Q_1(65)=0$) is an ephemeral river for which water use is short-lived within a year. The Group B ($Q_1(65)>0, Q_1(95)=0$) is intermittent and has an intermediate characteristic between the both. The rivers classified in Groups A ($Q_1(95)>0$), B ($Q_1(65)>0, Q_1(95)=0$) and C ($Q_1(65)=0$) makeup 68.5 %, 17.5 % and 14.0 % of the total river numbers, respectively. The regional distribution was formed with attention to the value of $Q_1(75)$.

(d) Identification of Water Resources Potential

In the assessment of water resources potential, three points of view, namely, “Quantitative potential of water in natural condition”, “Allowable water quantity under the artificial control” and “Seasonal stability of water availability” were taken into consideration. The assessment results are summarized below:

Summary of Water Potentials in Major Viewpoints

Viewpoints	Available data	Identification of water potential	Status
Quantitative potential of water in natural condition	“Map of Specific Run-off”	Areas having an annual averaged specific discharge more than or equal 1.0 m ³ /sec./500km ² could be identified as higher potential area.	To be considered largely
Allowable water under the artificial control	No information is available at the moment on a whole country basis.	It should be considered separately for scheme by scheme, by means of confirming individual water right.	To be referred if possible
Seasonal stability of water availability	“Map of Distribution of $Q_1(75)$ in Flow Duration Curves”	Areas having the value of $Q_1(75)$ more than or equal 10 % could be identified as higher potential area for perennial irrigation.	To be considered supplementary

Source: JICA Study Team

Quantitative share of groundwater within the whole hydrological cycle in the Mainland was identified at 0.4 % only. Therefore, for the purpose of determining the general water potential over the whole country, focus should be given to surface water.

2.6.2 Land Resources Potential

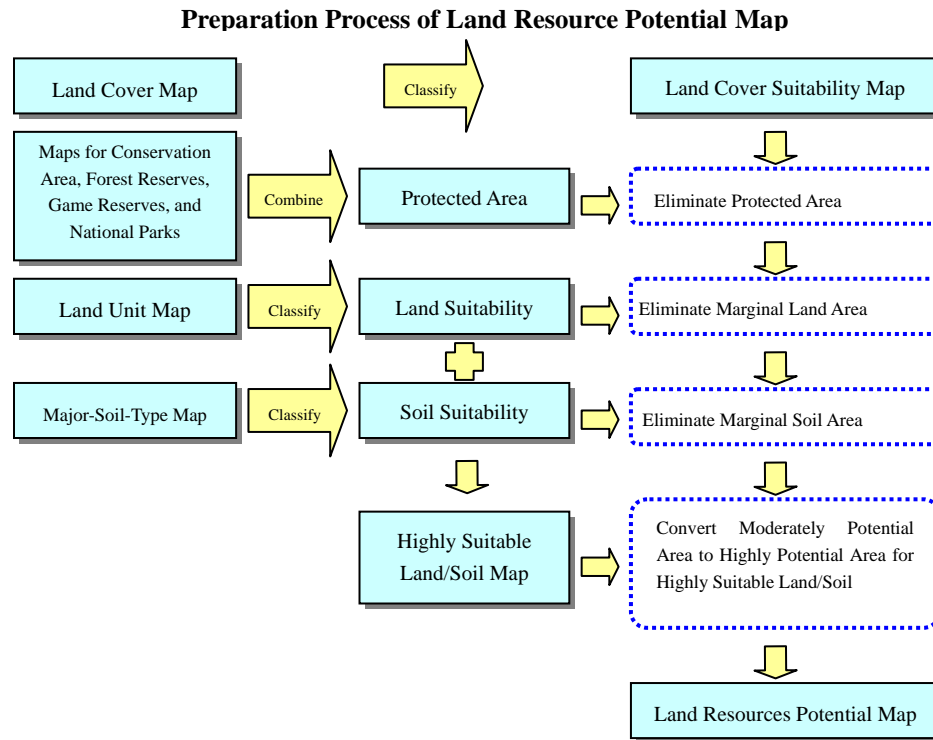
(a) Land Unit, Soil Type and Land Cover Classifications

Land units were classified into three major classes with the criteria based on slope, physical condition of the land and susceptibility to soil erosion. Soil types were

classified into three classes with the criteria based on natural soil fertility levels, soil profile characteristics, salinity levels and drainage characteristics. Land cover classifications included cultivated land as highly suitable, bushland and grassland as moderately suitable and all the other areas were classified as marginal areas.

(b) Identification of Land Resources Potential

The land resource potential map was created in the following manner.



2.6.3 Socio-economic Potential

(a) Assessment Methodology for Socio-economic Potential

Socio-economic potential for irrigation development was examined using population density, road density and food deficit on a district basis, since these are considered as indicators showing marketing conditions. Paved roads gave positive effects to the socio-economic potential according to the inventory survey results, so an area 50 km either side of roads was allocated an additional indicator.

(b) Identification of Socio-economic Potential

Assessment was made by overlapping three indicators: population density, road density, and food deficit. For population and road densities, all districts were classified into two areas, namely higher and lower density districts as compared with the average density in population and road (respectively) of the whole country excluding Zanzibar. Food deficit was evaluated from the results of questionnaire surveys and inspection by Food Security Department, MAFS. Out

of 99 districts, 25 districts are categorized as a high potential area, 58 districts as a medium potential area and 16 districts as a low potential area. Finally, the potential for the area within 50 km from the paved roads was identified.

2.6.4 Identification of Irrigation Development Potential Area

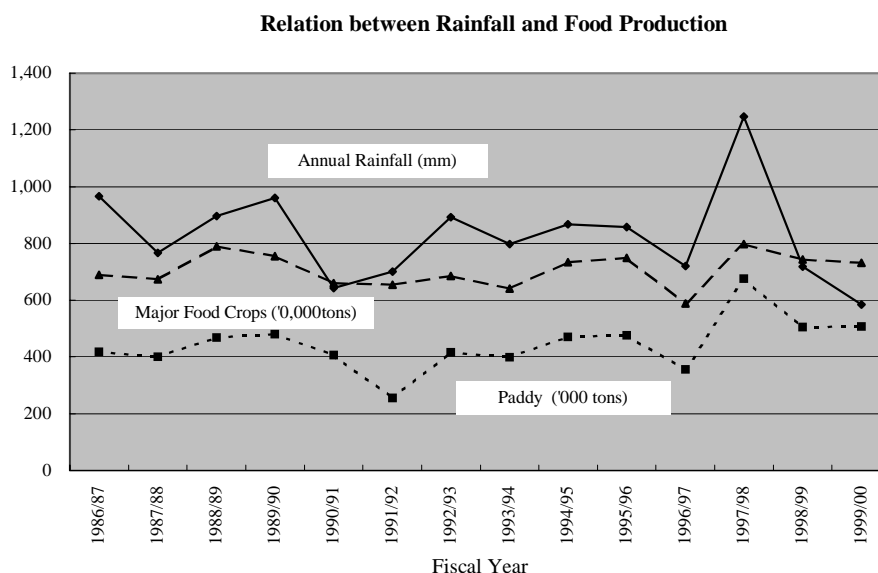
The demarcation of irrigation development potential area was made by overlaying three assessment maps: water resource, land resource and socio-economic potential maps, to identify High, Medium and Low Potential Areas. The study results show the division of the total area of 94.8 million ha, consisting of 2.3 million ha² for the “High Potential Area”, 4.8 million ha for the “Medium Potential Area”, 22.3 million ha of the “Low Potential Area”, 31.0 million ha for the “Forest/Marginal Area”, 7.3 million ha for the “Water Body”, and 27.1 million ha for the “Protected Area”.

2.7 Framework for Irrigation Development

2.7.1 Need of Irrigation Development

(a) Stabilization of Food Crops Production

Rainfed cultivation, which is prevailing in the Mainland, brings about unstable and low production due to erratic and unreliable rainfall. To improve this undesirable situation, irrigation is essential. The figure below shows the relation between annual rainfall and food production.



Source: Annual Rainfall (Tanzania Meteorological Agency, Ministry of Communication and Transport Major Food Crops (Maize, Rice, Wheat, Sorghum, Pulses, Cassava, Potatoes, Bananas: A Statistical Analysis of the 2000/01, Food Security Department, MAFS)

² This figure becomes 2.1 million ha if additionally considering the potential for the area within 50 km from the paved road as socio-economic condition, which is alluded in the Main Report of Master Plan...

The figure shows that rainfall brings about stability and increases in crop production. From this, it can be said that irrigation development is a key activity to improve the productivity and also an important factor to improve the profitability in agriculture.

(b) Poverty Alleviation

The Mainland faces a poverty problem. More than 80 % of inhabitants in rural areas, who are almost all smallholders, are categorized as living in poverty, and most are engaged in rainfed agriculture. Irrigation development is known to produce a more stable and higher production, thus irrigation development could be regarded as one of effective approaches to poverty alleviation in rural area.

(c) Environmental Conservation Effects of Irrigation Development

Inappropriate land husbandry practices might accelerate the soil erosion and the consequent flood hazard. Irrigation development could greatly contribute to the environmental conservation. Stable production and improvement of yield per unit area through irrigation development, could contribute to (i) the reduced expansion of cultivated area, (ii) the access to alternative energy sources and (iii) the creation of job opportunities. Furthermore, integrated soil and water management could be undertaken under a properly designed irrigation scheme, with erosion control, prevention of salt accumulation, flood protection and augmentation of underground water resources all achievable.

2.7.2 Objective and Strategies of National Irrigation Master Plan

(a) Primary Objective of ASDS

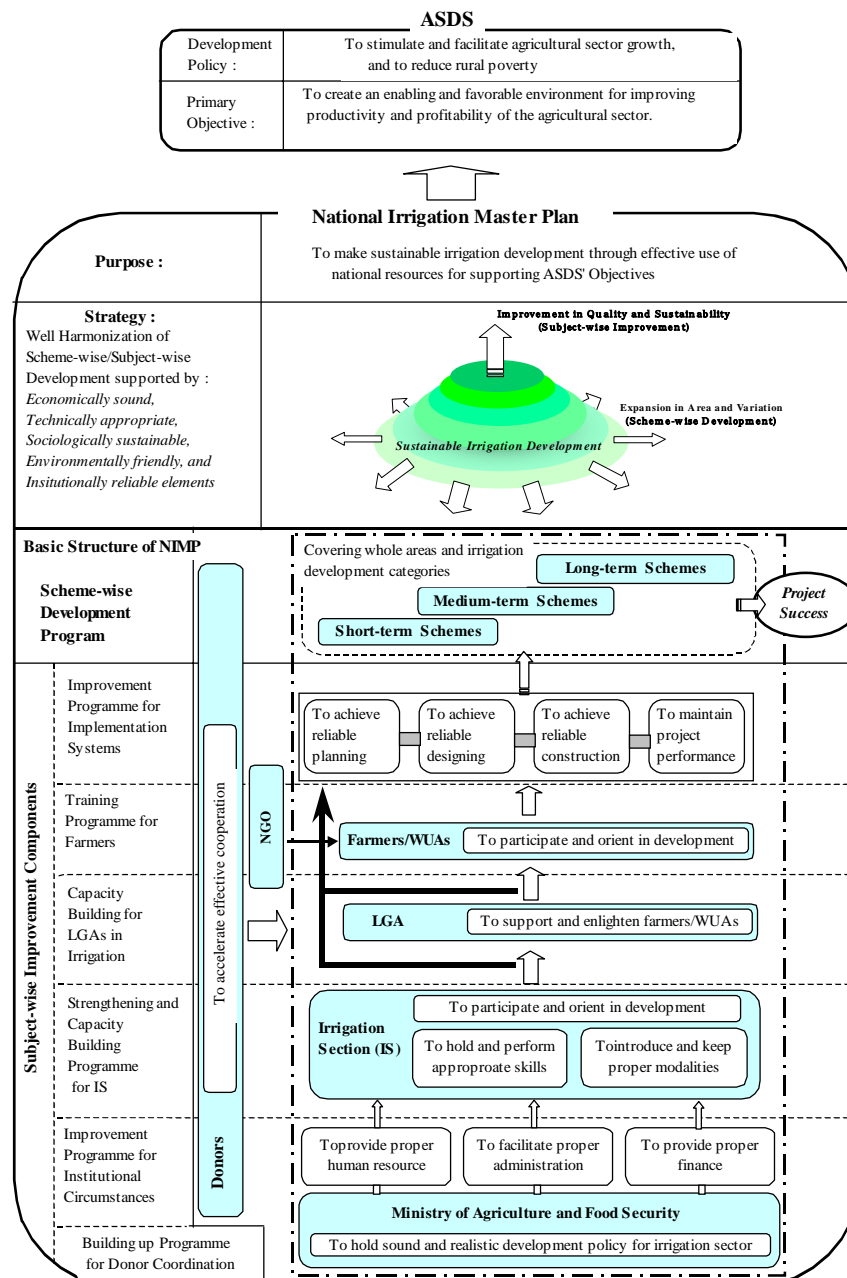
The ASDS defines that its primary objective is to create an enabling and conducive environment for improving the productivity and profitability of the agricultural sector as the basis for improved farm incomes and rural poverty reduction in the medium and long term.

(b) Purpose of NIMP

In view of the strategic activities/interventions stipulated in the ASDS and philosophy employed in the NIDP and also the study results, the “*Sustainable Irrigation Development*” was selected as a purpose of the NIMP with emphasis on comprehensive measures through “*Effective Use of National Resources*”, to largely contribute to attainment of the primary objective of ASDS. The “*Sustainable Irrigation Development*” means the establishment of technically and financially self-reliant irrigation schemes through institutional and organizational strengthening/reform.

(c) Strategy of NIMP

The NIMP proposes the two ideologies of Scheme-wise Development and Subject-wise Improvement, and a close linkage between them as a strategic approach to the sustainable irrigation development. The Subject-wise Improvement aims at creation of appropriate environment for sustainable irrigation development, mainly from a viewpoint of enhancing quality. The Scheme-wise Development aims at expansion of irrigation areas and variation using effective use of national resources including financial resources. Both Programmes shall be prepared in consideration of five elements; “Economically Sound”, “Technically Appropriate”, “Socio-logically Sustainable”, “Institutionally Reliable” and “Environmentally Friendly”.



2.7.3 Framework for National Irrigation Master Plan

(a) Policy Framework

The government has made some effort towards changing the government-oriented irrigation development into a farmers-oriented irrigation development, aiming at the final target of self-reliant irrigation development. Some progress has been achieved, but should be further accelerated. The policy framework requires strengthening or modification to create the enabling environment toward the self-reliant irrigation development by the private sector as follows:

Recommended Issues on Policy Framework

Policy Framework	Recommended Issues
- Legal Access to Land	Establishment of legal and physical access to land for establishment of self-reliant irrigation development.
- Dissemination of Water Rights Registration	Execution of educational campaign to clearly explain water rights.
- Act for Farmers' Organization	Need of appropriate act for WUAs for well management of irrigation projects.
- Favorable Taxes and Tariff for Irrigation Development	Set of sound taxes and energy tariffs for growing and profitable agriculture
- Policy on Food Security	Issuance of clear picture for food security especially rice and maize
- Close Communication with International Community	Strengthening of close communication with multi-donors for enhancing the assistance effect from donors.

(b) Macro-economic Framework

Through the analysis of actual development and recurrent expenditures to irrigation development from 1998/99 to 2002/03, expected financial resources are projected for three cases: High Case, Base Case and Low Case.

Conditions of Sensitivity Analysis

Variable	Base Case	High Case	Low Case
GDP Growth Rate	5.8% p.a. for 2003/04 – 2007/08; 5.9% p.a. for 2008/09 – 2012/12; 6.0% p.a. for 2013/14 – 2017/18	1.0% p.a. above Base Case	5.1% p.a. for the entire NIMP period (Ave. of 1999 – 2001)
Budget allocation to Irrigation Development	1.5% (of local fund portion of GOT Development Budget)	1.7%	1.5% (No increase)
Out-of-Budget Donors Assistance	100% (Same amount of foreign fund portion of Development Budget)	110%	100% (No increase)

The results of the sensitivity analysis are given below:

Results of Sensitivity Analysis on Total Budget for 15Years

Scenario	Financial Resources Envelope (million Tsh)*	in million US\$
Base Case	350,042	369
High Case	451,251	475
Low Case	327,967	345

* : Initial/Development Budget + Operation and Maintenance Budget

(c) Demand Projection for Staple Foods

A demand projection for staple food products was made using the current pattern of 2,300 kcal and the population of 53,464,000 estimated by the President's Office with the average annual increase rate of 3.08 %. The result is shown in the table to the right. Even with a rather pessimistic assumption that there is little economical development and calorie intake is kept at the current level, the pressure from the increased population will require a demand for rice 1.6 times bigger than the current amount as well as 2.6 times more for maize in the year 2017.

Future Demand for Staple Food Products

Crop	Year 2017
Maize	5,151
Rice	1,239
Wheat	322
Sorghum	1,118
Millet	917
Pulses	655
Cassava	6,007
Bananas	4,070
Potatoes	3,418

Unit : 1,000 tons

2.7.4 Basic Plan for Irrigation Development Level

(a) Concept

The function of a guideline for irrigation development level is to provide an indication of principles and technical issues for irrigation scheme implementation, not all of which must be obeyed inflexibly. Often, it may provide broad interpretation and allow for flexibility depending upon the peculiarity of a scheme site. Thus, the required guideline for irrigation development level could show a possible and most suitable modality of irrigation development by irrigation development pattern on the basis of recognition of potentiality and limitation of irrigation development of the relevant area.

(b) Guideline for Irrigation Development Level

The guideline for irrigation development level shall provide information regarding selected indicators by irrigation development patterns. The indicators on irrigation development level are extracted from among many prospective ones, taking views in Sustainability, Adaptability and Feasibility into consideration, namely, (i) Position of a balance in hardware and software aspects, (ii) Project Scale, (iii) Applicable Crop for Irrigation, (iv) Target Yield of Irrigation Crop, (v) Irrigation Method, and Modality of Irrigation System, (vi) Projected Project Life, (vii) Reliability of Project, (viii) Affordable Range of Project Cost, and (ix) Allowable Limit in Economic Indicator. Thus, the appropriate irrigation development level can be selected using these indicators.

2.7.5 Basic Plan for Institutional Development

(a) Basic Concept

A basic concept of the institutional development for the NIMP is to realize a practical and reliable institutional setting for sustainable and self-reliant irrigation development. The institutional development will be implemented in a stage-wise programme. Conformity to the Local Government Reform Programme (LGRP) is also essential.

(b) Institutional Development Components

The following three groups of the institutional development components are identified for NIMP and will support the participants of irrigation development to achieve good performances of their demarcated roles and functions:

Institutional Development Components

Components	Sub-components
Institutional Strengthening of the Irrigation Section	- Promotion of the Irrigation Section to a Department - Strengthening of Monitoring Function - Reform of Zonal Irrigation Office conforming to the LGRP
Legal Framework Strengthening for Irrigation Development Program	- Establishment of Legal Framework for the Irrigators' Organization - PPP (Public Private Partnership): Privatization Promotion
Smallholder Support Program for Self-reliance	- Strengthening of Operation and Maintenance Skills - Strengthening of Management Skills - Strengthening of Farmers' Access to Micro Credit and Finance Mechanisms

Source: JICA Study Team

2.7.6 Basic Plan for Agricultural Development

(a) Target Crops for Irrigation Development

It was concluded in NIDP that irrigation has a role in contributing towards food security and self-sufficiency in rice production at the national level. This principle is maintained under NIMP, too. In order to satisfy an increasing demand in excess of 1,200,000 ton at the year 2017, the future production of paddy should be increased. One big advantage of paddy production for farmers is that paddy can be used as subsistence food crop to supplement maize and at the same time as a cash crop. The demand on maize will similarly increase based on the future population increase. The demand projection shows that the total demand for maize will exceed 5 million ton per year by the year 2017. The major development on the future maize production should be carried out through full utilization of the remaining potentials under rainfed conditions. This can be achieved in the regions having a strong expectation of adequate rainfall such as Iringa, Mbeya, Rukwa and Ruvuma by expanding the cultivation area and also by increasing the yield per unit area through improvement in management for the supply of hybrid seed and

necessary farm inputs.

(b) Cropping Pattern

The present cropping pattern was estimated based on the crop production data of the year 1999/2000 with the existing irrigated area obtained from the current inventory survey. Since the major irrigated crops cultivated in the smallholders' field are paddy, maize and other crops including beans and vegetables, the analysis of the present cropping pattern was carried out by focusing on them. Based on the present cropping pattern, the future cropping pattern was planned according to the development direction and cropping intensity potential estimated from agro-ecological zone map. The overall alteration of cropping pattern at national level is shown as below.

Present and Future Cropping Patterns under Irrigation

Present Cropping Pattern (123.3%)				
Paddy (48.5%)		Maize (31.2%)		Others (44.0%)
Wet (39.5%)	Dry (9.0%)	Wet (31.2%)	Wet (29.3%)	Dry (14.7%)

Developing Direction and Cropping Intensity

Future Cropping Pattern (133.5%)				
Paddy (82.3%)			Maize (18.0%)	Others (33.2%)
Wet (63.5%)	Dry (18.8%)	Wet (18.0%)	Wet (18.5%)	Dry (14.7%)

Source: JICA Study Team

(c) Farming System Improvement Plan

Present farming practices prevailing in the majority of rainfed areas are likely to be of extensive cultivation, namely no application of fertilizer or agro-chemicals as well as low input of labour force. Proper farming practices should be adopted to take full advantage of irrigated agriculture and promote the productivity of crops cultivated based on the proper application of farm inputs. This would include the use of certified seeds of high yielding varieties or improved varieties with proper dosage of fertilizer and agro-chemicals under sufficient supporting services such as research and extension.

2.7.7 Priority Grouping of Inventorized Irrigation Schemes

(a) Prioritization Criteria of Inventorized Schemes

Prioritization of 1,428 inventorized irrigation schemes is made based on the following the criteria:

Prioritization Criteria

Item	Score	Item	Score
Technical Factor	15 points	Ease of Implementation	5 points
Economic Factor	30 points	Social Factor	20 points
Environmental Factor	10 points	Regional Conditions	20 points

Source: JICA Study Team

(b) Results of Priority Grouping

The results of the priority grouping are summarized as follows:

Summary of Priority Groupings

No.	Group	Nos.	Estimated Irrigation Area (ha)
(1)	On-going Schemes Group	29	13,600
(2)	“A” Group (Score : over 70)	50	34,800
(3)	“B” Group (Score : 61 – 70)	411	199,000
(4)	“C” Group (Score : 51 – 60)	538	158,700
(5)	“D” Group (Score : below 50)	108	19,300
(6)	“E” Group	127	343,100
(7)	Excluded Group	165	85,800
Total		1,428	854,300

Source: JICA Study Team

The “E” group consists of 127 schemes, which has one or more of the following characteristics:

- No rehabilitation work is in progress.
- They are National Agricultural and Food Cooperation (NAFCO) schemes or private irrigation schemes.
- They are smallholder irrigation schemes, but rehabilitation works have been conducted within the most recent 5 years;

The “Excluded” group of 165 schemes is categorized as “no need for rehabilitation/improvement and/or no smallholder schemes”.

2.7.8 Alternative Study for Development Target

(a) Projected Budget for Development

The Projected budget for irrigation development was estimated for 3 cases, namely High Case, Base Case and Low Case using the past actual expenditures and assuming the increase in GDP growth rate. The projected budget for development for each case is tabulated below:

Projected Development Budget

Case	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Total
High	18.7	20.0	21.4	22.8	24.4	26.0	27.8	29.8	31.8	34.0	36.4	38.9	41.7	44.6	47.7	466.0
Base	15.6	16.5	17.5	18.5	19.6	20.7	22.0	23.3	24.6	26.1	27.6	29.3	31.1	32.9	34.9	360.2
Low	15.5	16.3	17.1	18.0	18.9	19.9	20.9	22.0	23.1	24.3	25.5	26.8	28.2	29.6	31.1	337.5

Unit : Million US\$

(b) Possible Irrigation Development Areas by 2017

Taking into consideration the analysis results of the inventory surveys, the possible irrigation development areas by 2017 are calculated for 3 cases as follows:

Accumulated Irrigation Development Areas by 2017

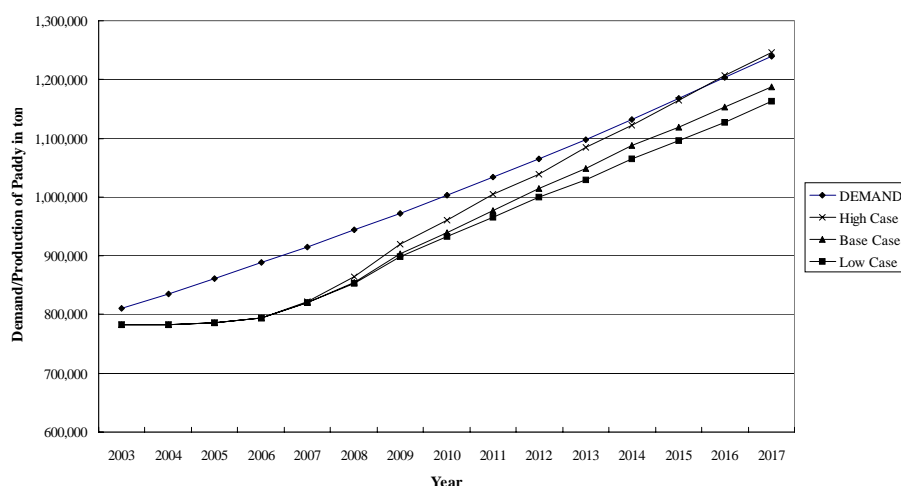
Case	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17
High	218	229	239	250	265	276	281	294	312	325	337	352	372	387	405
Base	218	228	236	243	254	264	271	278	290	304	316	325	335	351	362
Low	218	222	234	240	248	261	268	274	287	296	306	321	328	337	350

Unit: Thousand ha

(c) Comparison with Future Demand of Rice

The possible production of paddy was calculated for the above 3 cases in view of the build-up period. The table below shows a comparison of future demand for paddy with each case:

Projected Production of Paddy by Development Alternatives



As can be seen in this figure, the irrigation development areas under the High Case, say 405,400 ha will satisfy the paddy demand in 2017 subject to proper agricultural input supply. Since it is deemed that the projected budget for the High Case would be procurable, and also taking into consideration that the High Case could bring about a high possibility to meet the projected demand of paddy by the target year 2017, it was regarded as an appropriate scenario for the study on the development programme of the NIMP. If current budget to irrigation development continues in the future, namely the Low Case, the country will face a severe deficit of paddy. It is therefore expected that the GOT will allocate sufficient budget to irrigation development, at least equal to projections for the High Case.

2.8 Irrigation Development Programme

2.8.1 Development Scenario for the Year 2017

The NIMP aims to achieve sustainable irrigation development through effective use of national resources resulting in an increase in agricultural productivity. The development programme which implements the NIMP targets the establishment of sustainable irrigation development system by 2017 in a stage-wise development: Short Term (2003 – 2007), Medium Term (2003 – 2012) and Long Term (2003 – 2017). In due consideration of needs for structural reform of the agricultural sector, further strengthening of local governments under decentralization policy, and self-reliant irrigation development, the JICA Study Team elaborates the stage-wise development scenario for Subject-wise Improvement and Scheme-wise Development focusing on improvement in quality and expansion in area respectively.

Stage-wise Irrigation Development Scenario																		
	Short Term (2003 -2007)	Medium Term (by 2012)	Long Term (by 2017)															
Development Target	To Establish Sustainable Irrigation Development System by 2017																	
Key Issue for each Term	Reform	Decentralization	Self-reliance															
Subject-wise Improvement	<table border="1"> <tr> <td rowspan="2">Strategic Approach</td> <td>- Reform of environment for promotion of decentralization and involvement of private sector</td> <td>- Actualization of irrigation development by LGA's initiatives under decentralization</td> <td>- Establishment of easy access system from farmers on technical support</td> </tr> <tr> <td>- Establishment of appropriate technologies on irrigation development in cost-effective concept</td> <td>- Application of appropriate technologies on irrigation development in cost-effective concept</td> <td>- Spred of environmental protection method established</td> </tr> <tr> <td></td> <td>- Dissemination of concept of river basin approach</td> <td>- Establishment of environmental protection method on irrigation</td> <td>- Establishment of self-reliant irrigation development by private sector-oriented with public sector partnership</td> </tr> <tr> <td></td> <td>- Establishment of irrigation development system by participatory approach</td> <td>- Establishment of farmers-oriented irrigation development system</td> <td></td> </tr> </table>			Strategic Approach	- Reform of environment for promotion of decentralization and involvement of private sector	- Actualization of irrigation development by LGA's initiatives under decentralization	- Establishment of easy access system from farmers on technical support	- Establishment of appropriate technologies on irrigation development in cost-effective concept	- Application of appropriate technologies on irrigation development in cost-effective concept	- Spred of environmental protection method established		- Dissemination of concept of river basin approach	- Establishment of environmental protection method on irrigation	- Establishment of self-reliant irrigation development by private sector-oriented with public sector partnership		- Establishment of irrigation development system by participatory approach	- Establishment of farmers-oriented irrigation development system	
Strategic Approach	- Reform of environment for promotion of decentralization and involvement of private sector	- Actualization of irrigation development by LGA's initiatives under decentralization	- Establishment of easy access system from farmers on technical support															
	- Establishment of appropriate technologies on irrigation development in cost-effective concept	- Application of appropriate technologies on irrigation development in cost-effective concept	- Spred of environmental protection method established															
	- Dissemination of concept of river basin approach	- Establishment of environmental protection method on irrigation	- Establishment of self-reliant irrigation development by private sector-oriented with public sector partnership															
	- Establishment of irrigation development system by participatory approach	- Establishment of farmers-oriented irrigation development system																
Activities	Prepare and apply tailor-made improvement programme for project sustainability																	
Scheme-wise Development																		
Strategic Approach	Expand the irrigated area through development of irrigation schemes in effective use of national resources																	
Activities	Give priority to rehabilitation of small-scale irrigation and water harvesting schemes																	
Expected Annual Growth Rate of GDP	5.8 % to 6.0 %																	

2.8.2 Subject-wise Improvement Programme

The Subject-wise Improvement Programme is to build the foundation for establishment of self-reliant irrigation development by an appropriate public sector and private sector partnership, to contribute to improvement of agricultural productivity and profitability by (i) supporting scheme implementation, (ii) enhancing the effects produced by irrigation, (iii) sustaining irrigation

efficiency, and (iv) improving irrigation practices when hindered. The Subject-wise Improvement Programme presents 37 programmes consisting of 29 programmes for short term and eight programmes for medium term, which were provisionally classified based on (i) common programmes for all irrigation schemes, (ii) fundamental issues for irrigation schemes, (iii) harmonization with the Stage-wise Development Scenario, (iv) sound linkage with proposed styles of the scheme implementation in future, and (v) orderly relation of each programme in consideration of the whole context of the Subject-wise Improvement Programme.

2.8.3 Scheme-wise Development Programme

The development programme for irrigation schemes was prepared based on the results of priority ranking of inventorized irrigation schemes and review of possibly available financial sources. The development programme was, however, finally expressed for each term on the development area basis, mainly due to the limited data and information of irrigation schemes inventorized at the master plan level, lack of application of a bottom-up approach reflecting village government intension, and use of results of the existing inventory survey conducted under the River Basin Management and Smallholder Irrigation Improvement Project (RBMSIIP) in 1995. The inventory survey indicates that there are 1,428 irrigation schemes and an estimated 854,300 ha of irrigation area. Prioritization of the inventorized irrigation schemes was carried out in due consideration of five elements for sustainability of the irrigation development: *Economically Sound, Technically Appropriate, Sociologically sustainable, Environmentally Friendly and Institutionally Reliable*. Based on the results of the prioritization of the irrigation schemes and possibly available development budget, the irrigation development areas for three different time periods are estimated as follows:

Accumulated Irrigation Development Area

Type of Irrigation Schemes to Be Developed	Short Term	Medium Term	Long Term
	2003 - 2007	by 2012	by 2017
(a) Rehabilitation of Traditional Irrigation Schemes	180,000 ha	216,000 ha	274,000 ha
(b) Development of Water Harvesting Schemes	42,000 ha	57,000 ha	68,000 ha
(c) New Smallholder Schemes	44,000 ha	52,000 ha	63,000 ha
Total	266,000 ha	325,000 ha	405,000 ha

Source: JICA Study Team

2.8.4 Cost Estimate for NIMP Implementation

The total implementation cost for the NIMP is estimated at US\$ 593.9 million (including US\$ 110.6 million of Farmers' contributions), and is broken down to US\$ 23.0 million for the Subject-wise Improvement, US\$ 553.1 million for the

Scheme-wise Development and US\$ 17.8 million for on-going irrigation projects. The comparison shows that the required cost would be slightly higher than the projected development budget for some years. These deficits are still manageable and thus should be arranged by the GOT.

2.9 Conclusions and Recommendations

2.9.1 Conclusions

The Master Plan Study presents the framework and strategies for sustainable irrigation development for the Mainland with the target year of 2017, aiming to contribute to creation of an enabling and conducive environment for improving productivity and profitability of the agricultural sector.

In order to achieve this aim, the Master Plan Study prepared the development programme toward the year 2017. As a result, the Master Plan Study selected 37 programmes and 626 irrigation schemes as follows:

Components and Schemes to be Developed by 2017

Components and Schemes Developed	Short Term	Medium Term	Long Term
	2003 - 2007	by 2012	by 2017
(a) Subject-wise Improvement Programme			
- Components	29 nos.	8 nos.	-
(b) Scheme-wise Development Programme			
- Rehabilitation of traditional irrigation schemes (nos)	72	197	462
(ha)	179,800 ha	216,000 ha	274,600 ha
- Development of water harvesting schemes (nos)	64	92	122
(ha)	41,600 ha	57,200 ha	68,200 ha
- Construction of smallholder schemes (nos)	5	16	42
(ha)	43,800 ha	51,600 ha	62,600 ha
Total of (b) (nos)	141	305	626
(ha)	265,200 ha	324,900 ha	405,400 ha

Source: JICA Study Team

In the preparation of the development programme, the Master Plan Study established a prioritization system for implementation of the many irrigation schemes, and conducted a priority ranking of them for implementation using the data and information obtained through the inventory surveys. The availability of data and information on the scheme largely affected the priority ranking and therefore the ranking should be updated whenever new data and information becomes available.

The Master Plan Study concludes that implementation of these programmes would have a high probability of achieving the future demand for rice by 2017 with successful inter-sectoral coordination. In addition, it would produce (i) a cost saving of about US\$ 69 million required for rice import at 2017, (ii) increase of farm income to US\$ 450 per one crop season, (about 3 times the current rate), and

(iii) creation of job opportunities of 38 million man-days.

2.9.2 Recommendations

(a) Urgent Commencement of NIMP Implementation

The food deficit is a serious issue in Tanzania. The increasing population pressure will further aggravate the situation if appropriate countermeasures are not taken on time. It is therefore recommended that the NIMP be implemented as early as possible since irrigation development is a key factor to improve the productivity in agriculture.

(b) Urgent Need of Strengthening the Irrigation Section³

The Master Plan Study presents the implementation of 37 programmes as the Subject-wise Improvement Programme and 626 irrigation schemes as the Scheme-wise Development Programme by the year 2017. The Irrigation Section of MAFS shall be responsible for smooth implementation of the programme as a coordination agency with the different organizations involved.

(c) Legal Framework Strengthening for Irrigation Development

A sound legal framework is a prerequisite for successful farmers-oriented irrigation development, empowering farmers and the other private sectors to enable them to secure ownership, i.e. to take full responsibility for all decisions and matters involved in development, operation and management of the irrigation schemes. Legal status of irrigators' groups, land tenure and water rights, as well as ownership of and responsibility for irrigation infrastructure should be clearly defined for irrigation development. In particular, a new legal framework exclusively for the irrigators' groups is very important and necessary for securing their ownership and self-reliable irrigation development.

(d) Arrangement of Financial Resources for NIMP Implementation

The inadequacy of the financial resources available is one of the major constraints as can be understood from lessons learnt from unsatisfactory implementation of the NIDP. For smooth implementation of the NIMP, adequate budget allocation is essential. In this Study, the financial resource envelope for irrigation development was assessed using the past actual development expenditures allocated to the irrigation development and assuming an increase of the government budget in proportion with that of GDP growth rate. A sensitivity analysis was also made for three cases (High Case, Base Case and Low Case).

³ The Irrigation Section was promoted to the Division of Irrigation and Technical Services on November 19, 2002.

As a result, the High Case (for which a financial resource envelope is projected at US\$ 454 million for 15 years from 2003 to 2017), would enable implementation of 37 programmes and 626 schemes (including 29 on-going projects), which would bring about a possibility to meet the rice demand by 2017.

(e) Irrigation Development in River Basin Management

Recently, a focus has been put on a river basin management approach from the viewpoint of effective use of water resources among many different stakeholders. This approach is considered quite reasonable and acceptable, but it is important to evaluate the effective use of water resources without a prejudice view such as consideration of economic terms only. Over 70% of the total labor population is engaged in agricultural activities, and water is required both for domestic and agricultural purposes. Over 87 % of all poor people live in rural areas where agriculture is a mainstay in livelihood. Under such situations, the effective use of water resources should be evaluated from an overall viewpoint, not only an economic viewpoint. Irrigation development programmes should also be required to consider appropriate water management to reduce water loss.

(f) Need of Inter-sectoral Coordination

Irrigation provides an effective environment for stability and increase of agricultural production. There is no doubt that while irrigation itself directly links with the stability of agricultural production, improvements to irrigation become a major factor for creating a physiologically suitable environment for enhancing the agricultural production. Irrigation by itself could not produce a remarkable increase in agricultural production without assistance from other sub-sectors such as agricultural inputs and extension services. It is therefore recommended that other sub-sectors in the agricultural sector be developed under close coordination with the irrigation sub-sector, to enhance respective effects toward increase of agricultural production.

(g) Need of Updating of NIMP

The NIMP provides the overall framework and strategies for irrigation development toward the year 2017, and is based on the ASDP and the ASDS. The ASDP, which is defined as a 5-year rolling programme, will require updating every five years. The NIMP also requires to be updated at least every 5 years in conformity with the ASDP. If actual progress of scheme-wise development and subject-wise improvement are not satisfactory and/or additional data on the irrigation schemes become available, the NIMP should be updated without waiting for the five yearly reviews.

Chapter 3

Outline of the Action Plan Study



RRA workshop at Mgongola scheme, Morogoro Region

CHAPTER 3 OUTLINE OF THE ACTION PLAN STUDY

3.1 General

This chapter presents the outline of Action Plan Study conducted from November 2002 to September 2003. The Action Plan Study contains the objectives of the Action Plan, analysis of model irrigation schemes and selection of priority programmes, and the action plan for model irrigation schemes and priority programmes. Also, in the Action Plan Study, a special study was conducted for the major issues identified in problem analysis, and then results were reflected upon the action plan for model irrigation schemes and priority programmes. All these were compiled in a report titled “Action Plan Report, September 2003”.

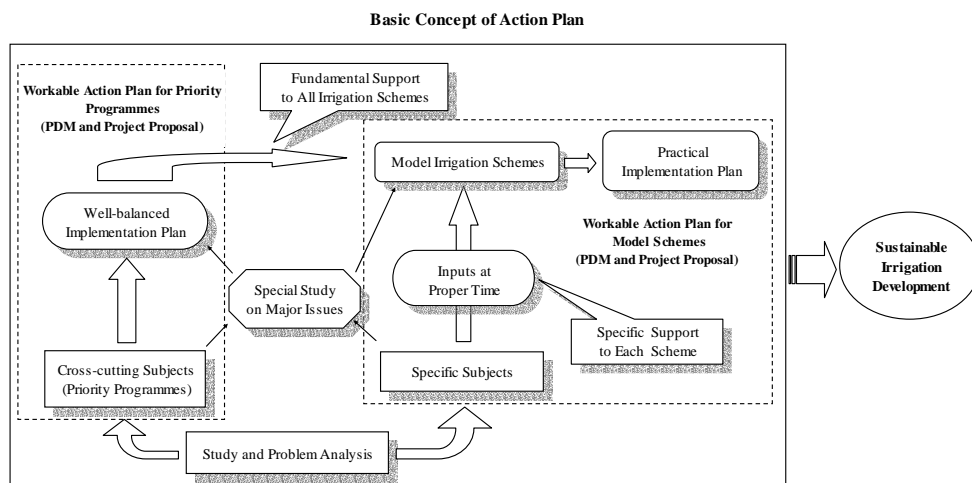
3.2 Basic Approach to the Action Plan

3.2.1 Objectives

The purpose of the Action Plan is to clarify 5W1H (Who, Why, When, Where, What, How) on implementation of the selected priority programmes for the Subject-wise Improvement Programme and Model Irrigation Schemes for Scheme-wise Development. The Action Plan also clarifies the proper combination among the selected Priority Programmes in implementation, which are fundamental and cross-cutting issues for almost all irrigation schemes, and the appropriate input time for specific subjects in the implementation of each Model Irrigation Scheme.

3.2.2 Basic Concept

The workable Action Plan for the selected priority programmes and Model Irrigation Schemes shall be worked out based on the following basic concept:



- (a) An Action Plan was prepared for the selected priority programmes from the Subject-wise Improvement Programme and for the selected Model Irrigation Schemes from the Scheme-wise Development Programme.
- (b) The selected Priority Programmes are many in number, and have a close relation with each other. The implementation order of each programme should thus be carefully determined, to heighten the synergy effect of each programme and finally to strengthen the support to the scheme development.
- (c) The number of Model Irrigation Schemes is determined at ten in total, through discussion with the DITS of MAFS based on the irrigation types prevailing in the Mainland and the available time for the Action Plan Study.

3.2.3 Selection of Model Irrigation Schemes

Selection purposes of the Model Irrigation Schemes are to show the workable Action Plan for each of them, taking into account suitable application time of the specific subject Programmes, and to confirm the selected priority programmes, based on the results of the Rapid Rural Appraisal (RRA) and/or site inspection for them. The ten Model Irrigation Schemes were selected from 626 schemes to be implemented by 2017 based on the following conditions and criteria:

Conditions and Criteria for Model Irrigation Scheme Selection

Condition	Criteria
Two each from the following irrigation types	- High demonstration effect to other similar schemes
- Traditional schemes	- Rehabilitation and/or expansion scheme
- Improved traditional schemes	- No overlapping with other donors/agencies projects
- Water harvesting schemes	- No concentration on specific area or region
- Modern schemes	- Good access to the site
- Pump schemes	- Availability of topographic maps (1/50,000)
	- Adequate data and information by previous study

The following table shows the ten Model Irrigation Schemes with their expected effects as models, which were finally selected under initiatives of the MAFS.

Finally Selected Model Irrigation Schemes

Irrigation Type	Region	District	Scheme Name	Area (ha)	Expected Effect as Model
Traditional Scheme	Lindi	Lindi Rural	Kinyope	480	Typical improvement of traditional scheme at low cost
	Tanga	Korogwe	Magoma	250	Improvement in flooded area
Improved Traditional Scheme	Kilimanjaro	Hai	Musa Mwinjanga	676	Low-cost rehabilitation of traditional scheme once improved
	Iringa	Iringa Rural	Pawaga	2,000	Rehabilitation of large-scale traditional scheme once improved
Water Harvesting Scheme	Kigoma	Kigoma Rural	Pamila	30	Pilot scheme of new water harvesting technology
	Dodoma	Kondoa	Kisese	50	Appropriate approach to water harvesting scheme for vegetable cultivation in large area
Modern Scheme	Kilimanjaro	Moshi Rural	Lower Moshi	1,560	Measures to resolve water conflict in river basin
	Morogoro	Morogoro Rural	Mgongola	620	Expansion scheme centering on the pilot scheme

Pump Scheme	Mwanza	Sengerema	Luchili-Nyakasungwa	20.5	Effective approach to pump schemes using lake water
	Kagera	Bukoba	Nkenge	32	Use of groundwater and surface water in conjunction

3.3 Analysis on Model Irrigation Schemes and Selection of Priority Programmes

3.3.1 Problem Tree and Objective Tree

RRA and/or site inspections were carried out for the ten selected Model Irrigation Schemes, aiming to (i) clarify operation and maintenance activities including water management and financial sources, (ii) grasp present activities of farmers' organizations and their relation with government authorities, and (iii) collect data and agricultural information. The results of these field works lead to the core problem of "Unstable irrigation water supply to field", so that the core objective of "Realization of stable irrigation water supply to field" was determined. The analysis identifies the common problems and their development approaches.

Development Approaches to Common Problems

Common Problems	Development Approaches
- Deterioration of irrigation infrastructures	- Construction, rehabilitation and improvement of irrigation infrastructures
- Insufficient maintenance works by farmers - Lack of farmers' skills for water distribution	- Enhancement of farmers' skills for operation and maintenance of irrigation infrastructures
- Poor management skill of IA, such as financial management, leadership, and decision making	- Strengthening of IA management capacity

3.3.2 Linkage of Identified Issues from Field Survey and Subject-wise Improvement Programme

The field works mentioned above clarified many problems in each scheme.

Institutional Issues

Based on the analysis of the problems identified above, the following countermeasures were proposed:

Summary of Countermeasures for Each Scheme

Countermeasures	Scheme									
	Kinyope	Magoma	Pawaga	Musa Mwinjamaga	Mgongola	Lower Moshi	Kisese	Pawaga	Nkenge	Luchili-Nyakasungwa
Support for organizing IA										
Support for IA registration										
Technical Trainig of IA management										
New legal framework for IA										
Introduction of competitive bottom up approach										
Backstop for bottom up movement by the government										
Harmonization mechanism of the government										

Source : JICA Study Team

The table indicates that “Technical Training of Irrigators’ Association (IA) management” is the most common countermeasure for the schemes. However, “Backstop for bottom up movement by the government” is the most essential and fundamental countermeasure among the listed countermeasures, in other words, it is the most important cross-cutting institutional issue for the ten Model Irrigation Schemes. In addition, the Subject-wise Improvement Programme previously identified in the Master Plan Study was examined resulting in three programmes of the “A-3: IA Strengthening Programme” being added to the 37 programmes extracted from the Master Plan Study in view of the need of IA strengthening.

Linkage of Countermeasures with Components of Subject-wise Improvement Programme

Category	A: Institutional Aspects					B: Systemizing Aspects
	A-1: DITS Institutional Improvement Programme	A-2: - LGA Institutional Strengthening Programme for Irrigation Development	-			B-1: DITS Working Mandate Formulation Programme
Original Programme	-	-	A-3: IA Strengthening Programme			-
Additional Sub-programme	-	-	A-3: IA Strengthening Programme			-
Sub-components added	-	-	New Legal Framework for IA Establishment Study	IA Organizing and Registration Support Manual	IA Management Training for Farmers	-
Countermeasures	-	-	-	-	-	-
Support for organizing IA	-	-	-	-	-	-
Support for IA registration	-	-	-	-	-	-
Technical Training of IA management	-	-	-	-	-	-
New legal framework for IA	-	-	-	-	-	-
Introduction of competitive bottom up approach	-	-	-	-	-	-
Backstop for bottom up movement by the government	-	-	-	-	-	-
Harmonization mechanism of the government	-	-	-	-	-	-

Source: JICA Study Team
: Priority in execution

Irrigation and Drainage Issues

As well, the same analysis was made for the irrigation and drainage problems identified, and necessary countermeasures for them are summarized as follows:

Summary of Countermeasure for Each Scheme

Countermeasures	Schemes									
	Kinyope	Magoma	Pawaga	Musa Mwinjagama	Mgongola	Lower Moshi	Kisese	Pamila	Nkenge	Luchili-Nyakasungwa
Establishment of proper technical manuals	-	-	-	-	-	-	-	-	-	-
Utilization of contractors in proper manner	-	-	-	-	-	-	-	-	-	-
Establishment of proper O & M Manual	-	-	-	-	-	-	-	-	-	-
Preparation of necessary provisions on IA	-	-	-	-	-	-	-	-	-	-
Achievement of proper river-basin management	-	-	-	-	-	-	-	-	-	-
Attainment of good participation	-	-	-	-	-	-	-	-	-	-
Strengthening of roles of LGA	-	-	-	-	-	-	-	-	-	-
Confirmation of standard roles of donors and NGO	-	-	-	-	-	-	-	-	-	-
Strengthening of capabilities of LGA and/or DITS	-	-	-	-	-	-	-	-	-	-

Source: JICA Study Team

This table shows that the most cross-cutting issue for the ten selected Model Irrigation Schemes in irrigation and drainage aspects is the “Establishment of proper technical manuals”

3.3.3 Selection of Priority Programmes

The Action Plan Study identified the need of further three programmes, so that the identified programmes came to be 40 in total. The priority programmes were thus selected from those 40 programmes in consideration of the current progress of ASDP implementation, the cross-cutting countermeasures obtained through RRA, and the strategic targets for the Short Term development programme presented in the Master Plan, such as (i) reform of environment for promotion of decentralization and improvement of the private sector, (ii) establishment of appropriate cost-effective technologies for irrigation development, (iii) dissemination of the concept of a river basin approach, and (iv) establishment of an irrigation development system by participatory approach. Tabulated below are the selected 18 priority programmes:

Selected Priority Programmes among the Subject-wise Improvement Programmes

No.	Ref.	Programmes
1	A1	DITS Institutional Improvement Programme
2	A2	Local Government Authority (LGA) Institutional Strengthening Programme for Irrigation Development
3	A3.1	New Legal Framework for IA Establishment Study
4	A3.2	IA Organizing and Registration Support Manual
5	A3.3	IA Management Training for Farmers
6	B1	Regularization of Irrigation Administration and DITS Working Mandate Formulation Programme
7	B2	Contract Management System Improvement programme
8	C1	Survey and Investigation Guideline Establishment Programme
9	C2.1	Planning Guideline Establishment Programme
10	C2.2	Designing Guideline Establishment Programme
11	C3.1	O&M Guideline Establishment Programme
12	C4	Farmers' Participation in Irrigation Development Programme
13	C5	Village Irrigation Development Guideline Establishment Programme
14	C7	Establishment of DADP Formulation Guideline for Irrigated Agriculture Development
15	D2	Technical Manuals Handling Guideline Establishment Programme
16	D3	Information and Database Improvement Programme
17	E1.5	Environmental Assessment Study for Irrigation Practice in Tanzania
18	E1.6	Study of River-Basin Approach in Irrigation Development

Source: JICA Study Team

3.4 Special Study on Major Issues Identified in Problem Analysis

3.4.1 Scheme Implementation Process

Until now, irrigation schemes were implemented by donors' initiatives, so donors were very influential in decision-making through almost all processes of scheme implementation. On the contrary, the GOT intends to give initiative to LGAs, farmers and legal entities of farmers and to activate outsourcing to the private

sector. Taking into consideration the new attempt, e.g. Village Level Planning Cycle (VLP) cycle management in Songea District and the ADSP implementation focusing on DADPs, a new process is proposed in the Action Plan. Notable challenges given in the new proposed implementation process from current method are enumerated as follows:

Changes from Current Method

No.	Remarkable Points of Improvement in Small Irrigation Scheme Implementation
Strengthening of Institution and Organization	
1	LGAs are mainstreamed in the process of planning, designing and construction of the scheme
2	Some procedures of scheme preparation to be done through mutual collaboration with local parties concerned are incorporated in the DADP formulation process
3	Preparation of organization of farmers legal entity is assumed to commence as early as possible after confirming scheme outline
4	It is preconditioned that a tender board consisting of adequate personnel is established prior to tender holding
5	Sound tendering and award system has to be introduced for proper contractor selection
6	Monitoring practice is systemized in the stage of operation and maintenance after construction works completed
Promotion of Farmers' Participation	
7	Farmers participate in the scheme implementation in any stage as satisfying a demand
8	The routines of participatory cycle management like VLP are applied into the implementation process
9	Farmers' contribution is given in any scheme implementation through allowable ways of contribution
10	Farmers contribution is mostly achieved through engaging construction works of minor canals etc. which are separated from the contractors' works under the supervision of the District engineer, otherwise participating contractors' construct main canals etc. under the proper arrangement of supervising consultant
Activation of Private Sector	
11	Proper F/S and D/D is carried out by way of engagement of consultants as required
12	Engagement of contractor in the construction works of scheme is preconditioned for the scheme implementation instead of force account management

3.4.2 Irrigators' Association

A well-organized IA is one of the crucial factors for successful irrigation development. Through the Master Plan Study, however, the following problems were identified:

- Insufficient legal framework for the IA
- Farmers' insufficient ability or lack of experience for the IA management
- Necessity of efficient technical training services for the IA member farmers

A new legal framework exclusively for the IA should be established, as it is necessary for securing the farmers' ownership and self-reliant irrigation development. At least, the following issues should be clearly included and defined in the new framework:

- Its main activities are operation and maintenance of the irrigation facilities. In that sense, the IA is a non-profit organization.
- The compulsory participation of all irrigators in the IA is a prerequisite of

irrigation development.

- The MAFS should become a competent authority of the IA, that is to say, the registrar of the IA.
- The MAFS should hold an appropriate coordination function of the water rights for irrigation development with the Ministry of Water and Livestock Development.

As for the management of the IA, the identified problems were as follows:

- Poor participation of members in the IA activities, such as operation and maintenance activities for irrigation facilities, meetings and etc.
- Lack of leadership of the IA executive committee.
- Poor awareness among farmers of the IA's importance and roles.
- Insufficient financial management ability

As the countermeasures, preparing a management manual for the IA and training program for the leaders is necessary.

3.4.3 Farmers' Participation and Bottom-up Approach

Farmers themselves are the main actors for successful farmers-oriented irrigation development. However, the present situation is far different from that and the farmers' initiative seems rather weak. The high risk associated with farming is the fundamental reason for the farmers' passive or defensive attitudes toward new investments including irrigation development. The high risk has been brought about by several interactive causes, which can be categorized into the following two: (i) the hardly manageable factors and (ii) the policy factors. The hardly manageable factors and policy factors include the following:

Hardly Manageable Factors	Policy Factors
- Severe natural conditions: tropical climate, endemic diseases such as malaria, schistosomiasis, sleeping sickness and etc., relatively low average life expectancy, the spread of Human Immunodeficiency Virus/Acquired Immuno-Deficiency Syndrome (HIV/AIDS).	- Poor rural infrastructure: poor conditions of irrigation facilities, rural electrification, access roads, domestic water supply, and etc
- Population: low population density, sparsely distributed population	- Instability of the macro economy: fluctuation of macro economic environment (inflation rate, foreign exchange rate, interest rate, terms of trade, and etc.)
	- State intervention in the economy: suppression of producers' price, and etc.
	- Underdeveloped rural financial institutions for the farmers: insufficient means of avoiding the high production risk for the farmers

Responding to the high risk, the farmers consequently intend to minimize income fluctuation rather than to maximize income. The lack of farmers' ownership and passive & defensive attitude toward new investment activities may be natural results of the high farming risk.

Therefore, alleviating their high farming risk is a prerequisite for successful promotion of farmers' participation and strengthening their ownership in the construction of irrigation facilities. Although the hardly manageable factors can not be easily managed, the governments should manage the policy factors properly, and their adverse effects on farming should be decreased as much as possible. However, the task is beyond the mandate of the irrigation sub-sector itself. The inter-ministerial approach and coordination is thus quite necessary for the management of the policy factors.

In the irrigation sub-sector, it is essential that farmers realize that construction of irrigation facilities itself is an important countermeasure toward mitigation of high farming risk and improvement of their income and poverty alleviation. Besides, the following countermeasures should be executed to strengthen the farmers' participation and ownership:

- Introduction of a new method for bottom-up and competitive project formation and selection
- Farmers' initiative strengthening
- Efficient support for the farmers' bottom up movement by the government.

3.4.4 Agricultural Inputs Supply and Marketing of Farm Products

Based on the survey results of the Model Irrigation Schemes, it was revealed that "Ensuring of Inputs" and "Establishment of Proper Approach to Marketing with Price Control" are the most common issues as conceivable countermeasures to solve the major problems of farmers in agricultural aspects. In fact, proper inputs supply and marketing are crucial to uphold the effect of irrigation development. The present interrelation between inputs supply/marketing flow and related support services is summarized in the figure shown above. The major recommendations for the improvement of the present interrelation are strengthening of the Agricultural Input Trust Fund (AGITF), provision of credit facilities, promotion of farmers' group formation, promotion of Market Development Center/Agricultural Marketing Systems Development Programme (MDC/AMSDP) to improve marketing, capacity building of farmers on marketing skills, support services for middleman/traders/processors and so on.

3.4.5 Environmental Consideration

The results of preliminary environmental assessments for ten Model Irrigation Schemes clarified that the focal points that need environmental consideration for the irrigation development are the conservation of protected areas and the prevention of vegetation degradation. The conservation of protected areas can effectively be achieved through the proper management of databases that were

collected in the course of the Master Plan Study. The prevention of vegetation degradation can be performed through the positive impacts of irrigation development as environmental conservation effects that were already emphasized in the Master Plan Study. The interrelation between the focal points of environmental consideration for irrigation development and Priority Programmes is summarized in the figure shown above.

3.4.6 Irrigation Regulations

The operation of irrigation regulations is essential for optimum management of irrigation schemes. On commencement of the Master Plan implementation, such regulations should be prepared urgently. The articles of the Irrigation Regulation are largely divided into two parts. One is for the government and the other for the private sector. The role of the government in irrigation development is changed from an active participant to a facilitator playing a regulatory role as providing support services and technical assistance. The private sector is classified into the IAs and the private companies.

The IAs, which are direct beneficiaries, are now expected and encouraged to play a much greater part in all stages of irrigation development. The Irrigation Regulation is therefore required to show concrete descriptions of the functions and duties of both the government and the IAs for irrigation development including farmers' contribution. The investment by the private companies in irrigated farming will be one of important alternatives in the future. The MAFS, in cooperation with relevant government agencies, should prepare a favorable and attractive legal and institutional framework for the private investors. Based on this legal and institutional framework, functions and roles of the private investors should be mentioned in the Irrigation Regulations.

3.5 Action Plans for Priority Programmes and Model Irrigation Schemes

3.5.1 Priority Programmes of Subject-wise Improvement Programme

(a) Basic Concept

The basic concept for preparation of the Action Plan which will be implemented in the Short Term (2003 to 2007), is to create an appropriate environment toward sustainable irrigation development from economically sound, technically appropriate, sociologically sustainable, environmentally friendly and institutionally reliable viewpoints, aiming to attain (i) reform of the environment for decentralization, (ii) involvement of the private sector, (iii) establishment of irrigation development systems by participatory approach, (iv) establishment of

appropriate technologies on irrigation development in a cost effective manner, and (v) dissemination of the concept of a river basin approach. These are the strategic targets in the Short Term proposed in the Master Plan.

(b) Action Plan

Priority Programme	Objectives
(a) DITS Institutional Improvement Programme (Code No.A1)	<ul style="list-style-type: none"> - To diagnose the organizational structure and management of the DITS, in particular focusing on its appropriateness for implementation of NIMP. - To implement the institutional improvement of the DITS based on that diagnosis so that it can execute its mandates successfully.
(b)LGA Institutional Strengthening Programme for Irrigation Development (Code No. A2)	<ul style="list-style-type: none"> - To diagnose the organizational structure and management of the LGAs, mainly focusing on the appropriateness of District Agriculture and Livestock Development Officers (DALDOs) for implementation of NIMP. - To implement the institutional improvement of the DALDOs based on that diagnosis, so that they can execute their mandates successfully.
(c)New Legal Framework for IA Establishment Study (Code No. A3.1)	<ul style="list-style-type: none"> - To make a recommendation for a new legal framework for the IA, which bestows an appropriate legal status on the IA - To define its rights and liabilities for irrigation development
(d)IA Organizing and Registration Support Manual (Code No. A3.2)	<ul style="list-style-type: none"> - To make a support manual for organizing and registration of IA, so that the extension service officers of the LGAs can provide the farmers with necessary information on organizing and registration of IA and guide them properly. - To provide a training programme for the extension service officers.
(e)IA Management Training for Farmers (Code No. A3.3)	<ul style="list-style-type: none"> - To prepare a training programme for the IA management. - To provide IA leaders with the training services, so that they can improve their management skills and manage their organizations successfully for realization of sustainable self-reliant irrigation development.
(f) Regularization of Irrigation Administration and DITS Working Mandate Formulation Programme (Code No.B1)	<ul style="list-style-type: none"> - To regularize irrigation administration - To standardize mandates of DITS in accordance with the irrigation regulation.
(g)Contract Management System Improvement Programme (Code No.B2)	<ul style="list-style-type: none"> - To establish or improve the contracts management system, which covers contract works and sub-contract tasks on irrigation development.
(h)Survey and Investigation Guideline Establishment Programme (Code No.C1)	<ul style="list-style-type: none"> - To prepare a practical Survey and Investigation Guideline which is convenient for conducting necessary site surveys and investigations for the sake of fulfilling high-quality planning and designing of new irrigation schemes and rehabilitating existing irrigation schemes
(i) Planning Guideline Establishment Programme (Code No. C2.1)	<ul style="list-style-type: none"> - To prepare a comprehensive and practical Planning Guideline which is convenient for planning of both new irrigation schemes and rehabilitation irrigation schemes.
(j) Design Guideline Establishment Programme (Code No. C2.2)	<ul style="list-style-type: none"> - To prepare a practical Design Guideline which is convenient for fulfilling proper designing of new irrigation schemes and rehabilitation irrigation schemes.
(k)Operation and Maintenance Guideline Establishment Programme (Code No. C3.1)	<ul style="list-style-type: none"> - To prepare a practical Operation and Maintenance Guideline which is convenient for conducting proper operation and maintenance of irrigation systems.

(l) Farmers' Participation in Irrigation Development Programmes (Code No.:C4)	- To enhance farmers' participation in irrigation, so that irrigation schemes are properly and continuously managed by farmers' themselves.
(m)Village Irrigation Development Guideline Establishment Programme (Code No.C5)	- To prepare proper guidelines for village irrigation developments like small-scale farmer-managed irrigation developments so as to be easier for LGAs use
(n)Establishment of DADP Formulation Guidelines for Irrigated Agriculture Development Programmes (Code No.C7)	- To prepare proper guidelines of DADP formulation for irrigated agriculture from technical and economical viewpoints.
(o)Technical Manuals Handling Guideline Establishment Programme (Code No. D2)	- To establish a teaching source for properly handling all technical references and information which are definitely important for improving and heightening irrigation technology.
(p)Information and Database Improvement Programme (Code No.D3)	- To establish or improve information systems and databases related to irrigation development, which are definitely necessary for monitoring the progress of irrigation development.
(q)Environmental Assessment Study for Irrigation Practice in Tanzania (Code No.E1.5)	- To conduct an environmental assessment study to correctly justify causal relationships between irrigation water use and environmental issues on water and land.
(r) Study of River-Basin Approach in Irrigation Development (Code No. E1.6)	- To conduct a planning study to correctly justify how to introduce a river-basin approach for irrigation water users.

3.5.2 Model Irrigation Schemes of Scheme-wise Development Programme

(a) Basic Concept

The Action Plan for the Model Irrigation Schemes is prepared under the following development concept:

Development Concept for Model Irrigation Schemes

Description	Development Concept
Technical Self-reliance	<ul style="list-style-type: none"> - Plan and design irrigation infrastructures taking into consideration farmers' capacity of O & M and water management. - Raising of technical knowledge of farmers on O & M and water management, providing appropriate training to them.
Financial Self-reliance	<ul style="list-style-type: none"> - Formulation of rehabilitation/improvement plan for irrigation infrastructure considering farmers' affordability for O & M. - Preparation of agricultural development plan, which leads to improvement of farmers' profitability, encouraging them to introduce vegetable farming.
Institutional/Organizational Strengthening	<ul style="list-style-type: none"> - Institutional strengthening for raising organizational management of IA, such as leadership, decision-making, and conflict resolution. - Institutional strengthening for raising financial management by IA, such as collection of water fee and O & M costs. - Promotion of farmers' participation in project implementation during planning, design, and construction periods.

(b) Action Plan

(a) Overall Goal	Improve agricultural productivity and profitability
(b) Project Purpose	Ensure a stable supply of irrigation water to the farms
(c) Outputs	<ul style="list-style-type: none"> - Strengthen capacity of IA management. - Rehabilitate or improve irrigation infrastructures. - Enhance skill of farmers for operation and maintenance of irrigation infrastructures.

The ‘objectively verifiable indicators’ will be: (i) 80% or more farmers participate in maintenance works by the end of the project, (ii) rehabilitation is completed by the specified year, and (iii) 100% of committee members are trained for O&M by the end of the project. To achieve the outputs mentioned above, the following activities were worked out:

Objectives and Activities

Objectives	Activities
(a) Capacity of IA management is strengthened.	- Raise farmers’ awareness of the project implementation.
	- Re-organize structure of IA.
	- Enhance leadership of committee members.
	- Strengthen decision making of IA.
	- Prepare by-laws and regulations.
	- Enhance financial management capacity of IA.
(b) Irrigation infrastructures are rehabilitated or improved	- Promote registration of IAs.
	- Conduct surveys and investigations with farmers’ participation.
	- Conduct Environmental Impact Assessments (EIA)
	- Carry out design works.
	- Make agreements on the project implementation including Programmes of rehabilitation/improvement works and farmers’ contribution to the works
	- Conduct pre-implementation activities including tendering and its evaluation.
	- Construct irrigation infrastructures with farmers’ participation.
- Turn-over O&M of completed irrigation facilities to IA.	
(c) Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced	- Raise farmers’ awareness of the project implementation.
	- Prepare irrigation schedule and maintenance plan.
	- Conduct water distribution.
	- Conduct maintenance works.
	- Enhance skills to mediate and resolve water disputes among members and with outside people
- Monitor performance of scheme	

Proposed Infrastructures for each Scheme

Scheme	Area (ha)	Proposed Infrastructures
(a) Kinyope	480	<ul style="list-style-type: none"> - Construction of Intake weirs (13 ea.) - Construction of main irrigation canal (unlined, length of 20,000 m) - Construction of secondary irrigation canal (unlined, length of 22,000 m) - Construction of turnouts (50 ea.) - Construction of farm ditches (length of 48,000 m) - Construction of drainage canal (length of 10,000 m) - Construction of related structures (Lump Sum)
(b) Magoma	250	<ul style="list-style-type: none"> - Construction of intake weir (1 site) - Construction of main irrigation canal (unlined, length of 10,000 m) - Construction of secondary irrigation canal (unlined, length of 11,000 m) - Construction of drainage canal (length of 10,000 m) - Construction of turnouts with intake ponds for treadle pump use (20 ea.) - Construction of partial flood dike (length of 2,000 m) - Construction of related structures (Lump Sum)

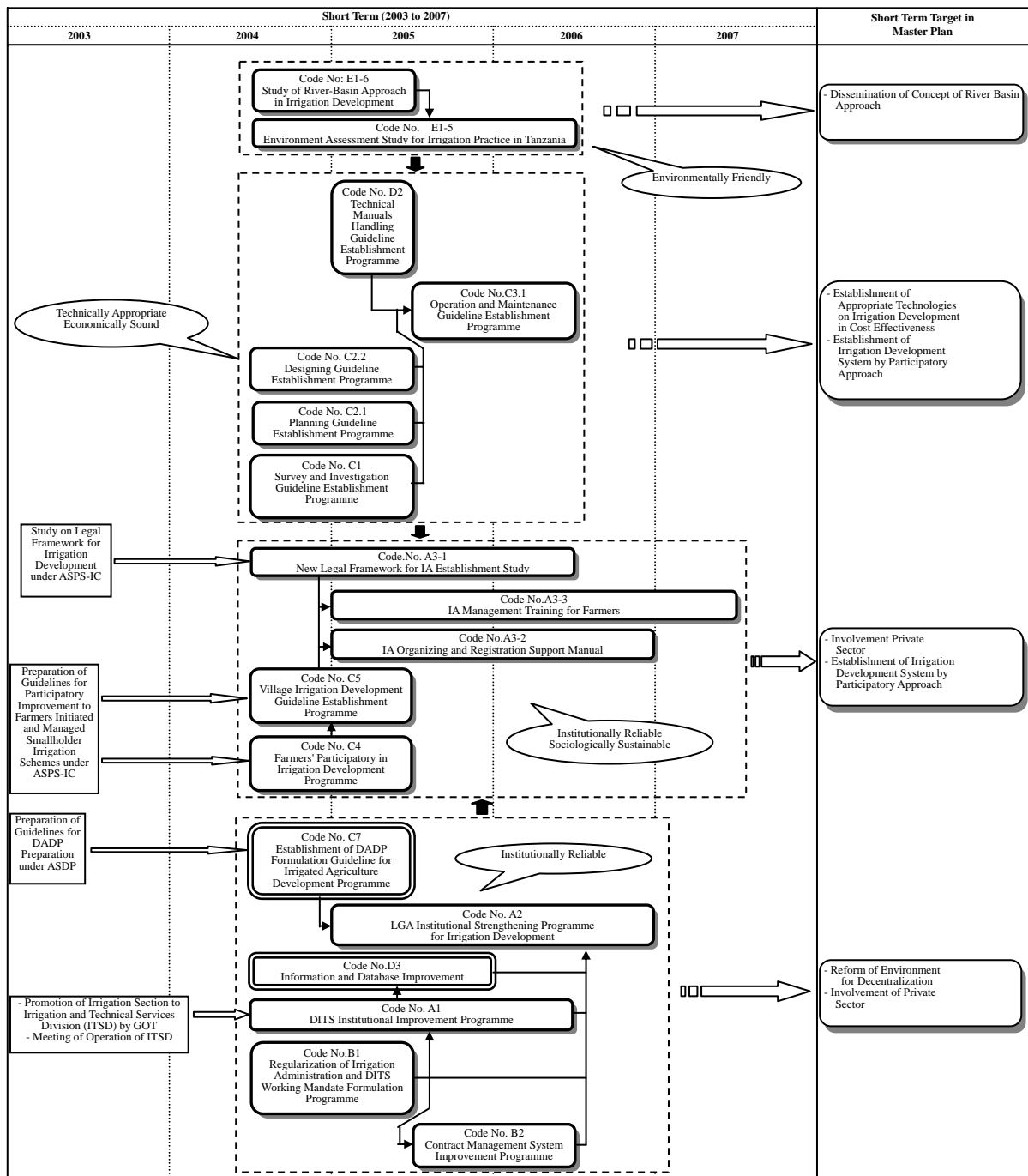
(c) Pawaga	2,000	<ul style="list-style-type: none"> - Remodeling of gabion weir (1 site) - Construction of silt extractor 1 (1 site) - Remodeling of irrigation channels (unlined, length of 10,400 m) - Construction of division structures (6 ea.) - Construction of drainage canals (length of 10,000 m) - Construction of related structures (Lump Sum)
(d) Musa Mwinjanga	676	<ul style="list-style-type: none"> - Reconstruction of intake weir (1 site) - Partial remodeling of canal alignment (length of 8,000 m) - Improvement of division structures (12 ea.) - Construction of drainage canal (length of 6,000 m) - Construction of related structures (Lump Sum)
(e) Mgongola	620	<ul style="list-style-type: none"> - Remodeling of intake weir (1 site) - Remodeling of diversion canal (unlined, 1,200 m) - Construction of main irrigation canal (unlined, 2,400 m) - Construction of secondary irrigation canal (unlined, 19,100 m) - Construction of drainage canal (13,100 m) - Construction of flood dike (9,800 m) - Construction of related structures (Lump Sum)
(f) Lower Moshi	1,560	<p>(a) Existing Lower Moshi Project (1,100 ha paddy field only)</p> <ul style="list-style-type: none"> - Rehabilitation of two intake weirs (intake/scouring sluice gates: 4 ea.) - Repairing of canal lining (Lump Sum) - Repairing of drains(Lump Sum) - Repairing of related structures(Lump Sum) <p>(b) Expanded Area (460 ha in total)</p> <ul style="list-style-type: none"> - Construction of intake weirs (8 ea.) - Improvement of existing canals (26 km) - Construction of drains (21 km) - Rehabilitation/construction of farm roads (30 km) - Construction of related structures (244 ea.) - Construction of flood dike (16 km)
(g) Kisese	50	<ul style="list-style-type: none"> - Construction of intake weirs (3 sites) - Construction of irrigation canal (unlined, length of 17,900 m) - Construction of storage reservoir (1 site with capacity of 260 m3) - Construction of drainage canal (length of 8,000 m) - Construction of related structures (Lump Sum)
(h) Pamila	30	<ul style="list-style-type: none"> - Construction of farm-bunds (covering 30 ha totally) - Construction of drainage canal (length of 1,300 m) - Construction of farm-passes (length of 2,500 m) - Procuring of equipment for verifying the new water harvesting method (Lump Sum) - Construction of related structures (Lump Sum)
(i) Nkenge	32	<ul style="list-style-type: none"> - Remodeling pump house and related intake facilities (1 site) - Installation of pump and its accessories (1 set) - Reconstruction of irrigation canal (unlined, length of 2,100 m) - Reconstruction of drainage canal (length of 1,600 m) - Construction of small dam (1 site) - Diversion canal related to the small dam reservoir (length of 1,500 m) - Construction of related structures (Lump Sum)
(j) Luchili-Nyak asungwa	20.5	<ul style="list-style-type: none"> - Remodeling of pump system (1 site) - Re-installation of pump facilities (1 set) - Replacement of delivery pipe (length of 1,890 m) - Repair of existing canal system (Lump Sum) - Construction of related structures (Lump Sum)

3.5.3 Time Framework

18 Selected Priority Programmes

The time framework for these items was worked out focusing on (i) commencement of the fiscal year when new budget is available, (ii) relation of on-going and completed programmes closely related to them, and (iii) IA as main actor for irrigation development in addition to the five conditions mentioned in the Master Plan. The framework also shows the relation between the programmes and the proposed Verification Study to be conducted later. It is illustrated below.

Illustrated Time Framework of Priority Programmes of Subject-wise Improvement Plan



Scheme-wise Development Programme in Short Term (2003 to 2007)

The implementation schedule for the Scheme-wise Development Plan in the Short Term was prepared on a regional area basis. The schedule also shows development areas for three irrigation types such as (i) rehabilitation of traditional irrigation schemes, (ii) water harvesting schemes, and (iii) new smallholder irrigation schemes.

Accumulated Irrigation Development Area on Regional Area Basis

Unit: ha

Region	by 2002*	Short Term (2003 - 2007)					
		2003	2004	2005	2006	2007	
Arusha	51,186	51,374	51,383	51,541	51,625	53,825	
Coast	1,133	3,085	3,380	3,380	3,380	5,380	300,000 ha
Dar es Salaam	4	4	4	4	4	4	
Dodoma	4,313	4,313	4,313	4,313	4,313	4,313	290,000 ha
Iringa	6,306	6,424	6,424	6,424	6,424	6,424	
Kagera	15	15	15	15	15	15	280,000 ha
Kigoma	4,800	4,800	4,800	4,800	4,800	5,800	
Kilimanjaro	45,738	46,548	46,738	47,428	49,038	49,448	270,000 ha
Lindi	1,406	1,406	4,206	4,206	4,206	8,264	
Mara	611	661	661	661	661	2,321	260,000 ha
Mbeya	35,249	35,249	35,249	36,189	39,289	39,289	
Morogoro	25,144	28,921	30,806	32,496	34,856	35,546	250,000 ha
Mtwara	2,690	2,690	2,690	2,690	2,690	3,690	
Mwanza	1,108	6,865	9,365	10,152	11,702	11,922	240,000 ha
Rukuwa	5,236	6,436	7,936	8,306	8,606	8,606	
Ruvuma	198	198	198	198	433	433	230,000 ha
Shinyanga	2,500	4,000	6,100	6,500	8,500	10,100	
Singida	2,055	2,655	3,155	5,195	5,195	5,195	220,000 ha
Tabora	3,121	3,121	3,121	3,121	3,121	3,121	
Tanga	8,626	8,876	8,876	11,476	11,500	11,500	200,000 ha
Total	201,439	217,641	229,420	239,095	250,358	265,226	
Development Area to be Increased		16,202	11,779	9,675	11,263	14,868	
For Irrigation Type							
Rehabilitation of Traditional Schemes	152,103	155,703	161,682	167,717	173,610	179,778	
Development Area to be Increased		3,600	5,979	6,035	5,893	6,168	
Water harvesting Schemes	13,489	21,389	27,189	30,829	36,199	41,619	
Development Area to be Increased		7,900	5,800	3,640	5,370	5,420	
New Smallholder Schemes	35,847	40,549	40,549	40,549	40,549	43,829	
Development Area to be Increased		4,702	0	0	0	3,280	

Source: Master Plan Report prepared by JICA Study Team in 2002.

Note:

* : Developed Area (191,900 ha by 2001) + Developed Area under On-going Project in 2002

3.6 Recommendations

(a) Support for Irrigation Scheme Formulation Process in DADP

Under the decentralization policy, each District Office prepared a DADP, which included many irrigation schemes. The irrigation development will be duly started based on the DADPs. However, through the site inspections for many irrigation schemes and the discussions with district staff on DADPs, it was found that the development plans for irrigation schemes were not clear, especially from technical and economical viewpoints, and also there were no definite criteria for selection of appropriate irrigation schemes. In the consecutive activities for irrigation development, the planning of irrigation schemes, including selection of

appropriate irrigation schemes, is the most fundamental activity as a starting point toward sustainable irrigation development. To improve this situation, it is recommended that practical guidelines on the proper process of scheme formulation should be prepared, and capacity building should be provided for district staff concerned simultaneously. Besides, it is recommended that a simple database system should be established at the DITS of MAFS, to support the District Offices by providing necessary data and information for irrigation scheme formulation.

(b) Strengthening of IA

IA is a main actor for operation, maintenance and management of an irrigation scheme. However, most IAs are too weak institutionally, financially and technically to fulfill the above activities. Based on the results of RRA and site inspections executed for Model Irrigation Schemes, the Action Plan study proposes the IA Strengthening Programme. In this connection, the ASPS has started a study on improvement of legal framework for irrigation development, aiming to provide an appropriate, comprehensive and coherent legal framework for irrigation development based on the results of the in-depth review of existing legal framework. In view of the above, it is recommended that the IA Strengthening Programme, as well as improvement of legal framework based on the ASPS report, should be started as early as possible to establish the firm IAs indispensable for sustainable irrigation development.

(c) Promotion of Farmers' Managed Irrigation Scheme Development

The Master Plan delineates the development scenario by 2017, with a target of irrigation development areas of 405,000 ha by 2017. In order to fulfill this target, irrigation development should be carried out steadily. In general, large-scaled irrigation schemes, which are more than about 500 ha, as discussed with the MAFS staff, require more complicated operation, maintenance and management than the small-scaled ones and need more time for creating a proper environment for successful implementation. Small-scaled irrigation schemes, especially farmers' managed irrigation schemes, could be comparatively easily handled by farmers with less support by the GOT. The farmers' managed irrigation schemes are thus recommendable to start urgently in cooperation with other sub-sectors on agricultural inputs, extension services, marketing and micro-finance, to enhance the irrigation effect.

Chapter 4

General Information for the Verification Study



Kickoff meeting on irrigation scheme formulation for Mkuranga District, Coast Region

CHAPTER 4 GENERAL INFORMATION FOR THE VERIFICATION STUDY

4.1 Bottleneck Problems Identified for the Verification Study

A Verification Study was conducted for bottleneck problems hindering the smooth implementation of irrigation schemes, to seek proper measures to solve them. As the results of the Master Plan Study and the Action Plan Study, lots of problems were found hindering smooth irrigation development. Of those, the following two problems were taken up as bottlenecks, especially considering the decentralization policy:

(1) Lack of Proper Irrigation Scheme Formulation Process for DADP

The site inspections for many irrigation schemes with existing development plans in hand and the discussions with district staff on DADP indicated that the development plans for irrigation schemes were not clear. This was especially from technical and economical viewpoints, and also because there was no definite criteria for selection of appropriate irrigation schemes.

The success of the irrigation development depends upon good performance in all circumstances surrounding irrigation development, such as good planning, good designing, good construction, and good O&M. In these consecutive performances, the planning and the selection of appropriate irrigation schemes are the most fundamental activities as a starting point toward successful implementation of them all.

To improve this situation, it is essential to train a district staff using the practical guidelines which show proper process of scheme formulation listed in the DADP. By this they will be able to formulate the irrigation schemes properly.

This subject is closely related to the priority programme “**C7: Establishment of DADP Formulation Guidelines for Irrigated Agriculture Development**”.

(2) No Data and Information Management System at DITS, MAFS

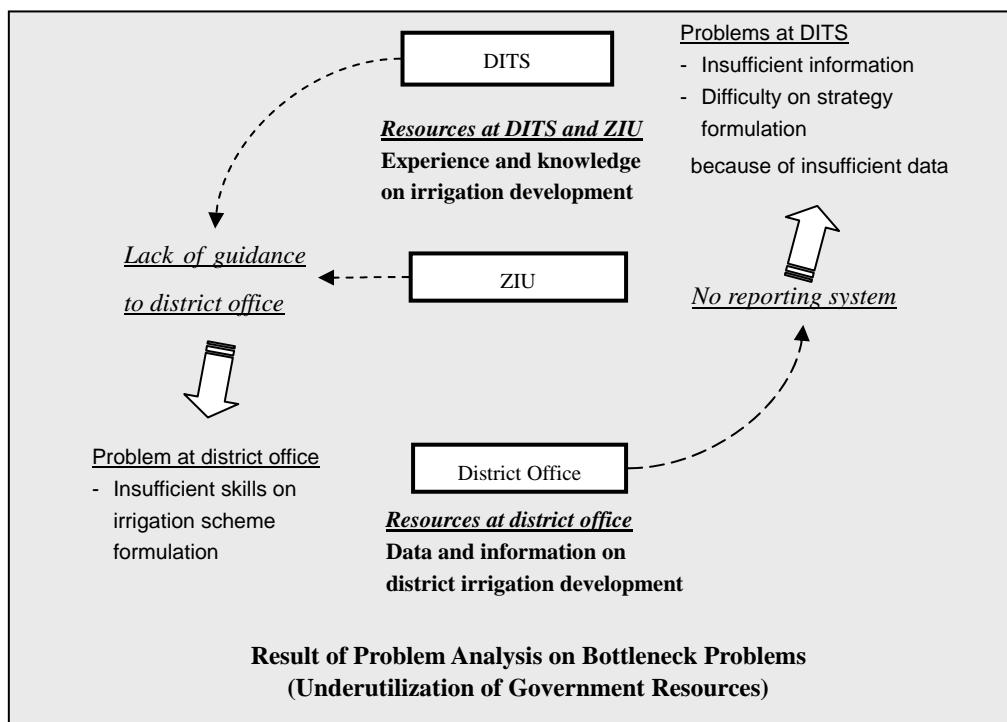
The MAFS should grasp the conditions of irrigation development in each district on time. It is difficult or rather impossible to appropriately manage irrigation development at the national level without timely data and information. At present, the DITS has a Monitoring Unit. However, this Unit is not functioning due to lack of facilities and inexperienced staff. Thus, a simple database system is urgently required at the DITS of MAFS. All information on the condition of irrigation development should be sent to the DITS. On the other hand, the Central Government should send to the district offices basic data and information such as

the results of inventory surveys, topographic maps and the current condition of irrigation development because most district offices have insufficient data on irrigation development. The exchange of data and information between the DITS and each district office would be very useful for effective irrigation development management.

This subject is closely related to the priority programme “**D3: Information and Database Improvement Programme**”.

(3) Relationship of These Bottleneck Problems

A relationship between two bottleneck problems is illustrated below:



4.2 Objectives of the Study

In order to settle the bottleneck problems mentioned above, objectives of the Verification Study are to prove that:

- Irrigation scheme formulation for the DADP could be done by district staff using the appropriate guidelines and with support of the ZIU; and
- DITS could properly manage data and information by establishing a database system including an operation manual.

4.3 The Study Area

It was agreed between the JICA Study Team and the MAFS that the Verification

Study should be conducted for two model districts. Selection of the model districts was made based on the following criteria.

1. Existence of irrigation development highly prioritized,
2. Less assistance from other donors,
3. Availability of active staff as counterpart, and
4. Easy access from Dar es Salaam.

As a result, Mvomero district in Morogoro region and Mkuranga district in the Coast region were selected. Locations of these districts are shown below.



4.4 Overall Schedule of the Verification Study

Overall schedule of the Verification Study is as shown on the next page. The Verification Study consists of four phases. Activities in each phase are summarized as follows:

Procedure-1: Preparation of prototype database system and draft guidelines

Procedure-2: (a) Modification and finalization of prototype database system and draft guidelines through trial usage of those tools.

(b) Training on the database system operation and guidelines usage.

Procedure-3: Seminar on the Verification Study

Procedure-4: Preparation of the Verification Study report

Activity	Year 2004											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
VS-1: Establishment of Simple Data and Information Management System												
1) Establishment of prototype database system	■	■	■									
2) Rectification of the prototype database system						■	■	■				
3) Training on the database system operation						■	■	■	■			
VS-2: Support on Irrigation Development Planning												
1) Preparation of draft	■	■	■									
2) Rectification of the draft guidelines						■	■	■				
3) Training on the irrigation development planning						■	■	■	■			
Seminar of the Verification Study Result												
1) Seminar										■		
Preparation of the Verification Study Report												
1) Report Preparation											■	

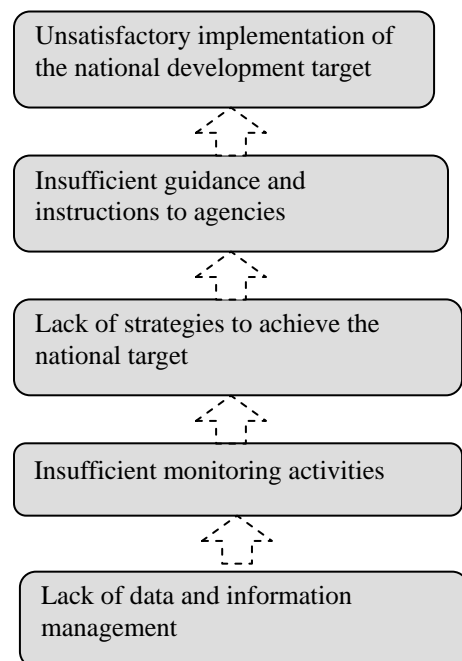
Overall Schedule of the Verification Study

4.5 Actual Situation before Starting the Verification Study

4.5.1 Data and Information Management at DITS

In the DITS, there was the Monitoring Unit, however, it did not function well due to limited budget, staff and facilities. In connection with the establishment of a simple database system in the Verification Study, the DITS organized the Data and Information Management Unit (DIMU), and assigned two experts. Status of data and information management before the Verification Study was confirmed by the questionnaire survey to staff of the DIMU. The survey result showed that the previous data and information management was partially made by exchanging hard copies of documents. It also showed that the National Irrigation Development Plan (NIDP) in 1994 indicated the importance of data and information management, while comprehensive data and information management was not conducted mainly due to lack of (i) skilled staff to establish a database system, (ii) awareness of the importance of a database system, and (iii) funds.

This insufficient management must be one of the reasons for unsatisfactory implementation of the NIDP, as illustrated on the right.



Negative Effect of Insufficient Data and Information Management

4.5.2 Irrigation Scheme Formulation for DADPs in Two Model Districts

(1) Mvomero District

Mvomero District was recently created through the division of Morogoro District into two districts. Mvomero District itself has, therefore, no experience in preparation of DADP. Instead, DADP previously prepared by Morogoro District was taken as a baseline of status in Mvomero District.

In the Morogoro District DADP, the Kiroka irrigation scheme was selected. According to the staff who was engaged in the planning, he said there was not enough time to visit other irrigation schemes. The Kiroka irrigation scheme was thus selected without any screening or prioritization works. He also explained that the main constraint on irrigation scheme formulation was time. He was given only a few days for determination of a candidate scheme for DADP. The cost estimate was made without a detailed survey. The outline of the DADP of Morogoro District is shown in the next page.

(2) Mkuranga District

In Mkuranga District, irrigation development in the last year was not included in DADP. The main reason was the limited budget according to the results of questionnaire surveys. The district staff said that another reason was their insufficient knowledge of irrigation scheme formulation. The DADP of Mkuranga District is outlined on pages 4-7.

(3) Technical Support to District on DADP Preparation by Morogoro Zonal Irrigation Unit

Questionnaires and interviews were also conducted with staff of Morogoro Zonal Irrigation Unit (ZIU) to grasp the actual situation of their technical support to district offices on the preparation of DADP. The result was that they did not provide district offices with any technical support on DADP preparation, although they gave some technical advice to them on tendering procedures and construction. ZUI staff understood that they were trouble shooters, since district offices only requested support from them when certain problems had occurred. However, recently, they are expanding their tasks from trouble shooters to technical advisers. They are trying to be involved in DADP preparation as well. This was due to the fact that they came to know that some district offices could not take proper action even six months after receiving budget for irrigation development. However, the support on irrigation development to district offices is not being done systematically at present.

Outline of the Latest DADP in Morogoro District	
Prepared by	District Executive Director's Office, Morogoro
Prepared date	March, 2003
Proposed initiatives	<ol style="list-style-type: none"> 1. Construction of seven water dams in Morogoro and Mvomero District, 2. Facilitation of communities in Ngerengere, Mikese, Mvuha and Mvomero (Kibati) wards to form SACCOS, one for each ward, 3. <u>Paddy production irrigation scheme in Kiroka village, Morogoro District.</u> 4. Promotion of animal traction technology, 5. Rehabilitation of four dip tanks and construction of two dip tanks in Morogoro and Mvomero Districts, 6. Promotion of indigenous/traditional chicken production in Mvomero and Morogoro Districts, 7. Support to sustainable small scale dairy farming in Mvomero District, and 8. Monitoring and evaluation.
Total budget	Tsh. 299,751,481
No. of initiatives related to irrigation	One (Improvement of Small holders Paddy Irrigation Scheme in Kiroka Village)
Outline of the Proposed Irrigation Development Plan	
Project name	Improvement of Small holders Paddy Irrigation Scheme in Kiroka Village
Objectives	Introduction of irrigation system to rainfed paddy in Kiroka village.
Proposed works	Survey, planning, design and construction of irrigation facilities.
Proposed irrigable area	80 ha
Proposed crop	Paddy
Project cost	Total Tsh.37,640,481 contribution of Government (Tsh.32,920,481), district council (Tsh.1,000,000) and district community (Tsh.3,720,000)

Source: District Agricultural Development Plan, Morogoro District 2003-2004

Outline of the Latest DADP in Mkuranga District	
Prepared by	District Executive Director Mkuranga District Council
Prepared date	
District agricultural priorities	<ol style="list-style-type: none"> 1. Increase of production of both cash crops through better practices/farming methods as technically advised by agricultural personnel. 2. <u>Irrigated agriculture at river basins</u>
Ongoing irrigation development program/project	Yavayava irrigation scheme (in Yavayava and Kisayani villages)
Method applied to choose priority sub-sector (project)	SWOT analysis
Constraints	<ol style="list-style-type: none"> 1. Low yield per area/per livestock by farmers. 2. Low funding to agricultural development by the government and other agencies. 3. Poor or lack of organizational ability among the community. 4. Competing time allocation between farm and off farm activities. 5. Low re-investment to farm business (from accrued benefits realized from the same). 6. Lack of clear and reliable marketing information. 7. Low funding for agricultural development 8. High post harvest losses 9. Young people migrating to the urban centers.
Quick wins	<ol style="list-style-type: none"> 1. Increasing cashew and poultry production. 2. <u>Adopting irrigated agriculture for horticultural and semi annual crops.</u> 3. Use of recommended crop varieties and livestock species. 4. Grading of farm produces. 5. Processing of farm produces. 6. Rising of marketable livestock species and crop varieties. 7. Strengthening primary production and marketing cooperative societies.
Selected project to be implemented in 2004 from the quick wins.	Increasing cashew and poultry production
Total budget	Tsh. 95,129,000

Source: District Agricultural Development Plan, Mkuranga District 2003-2004