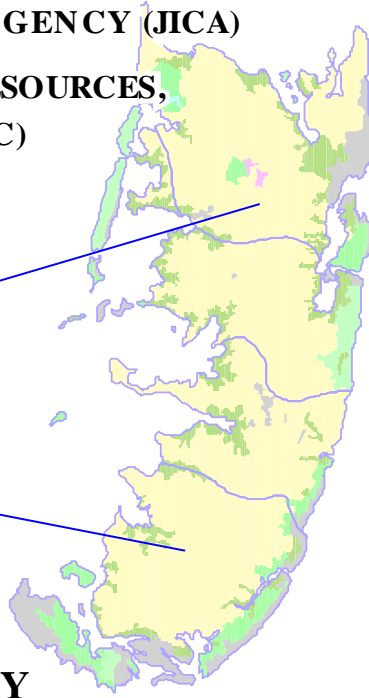
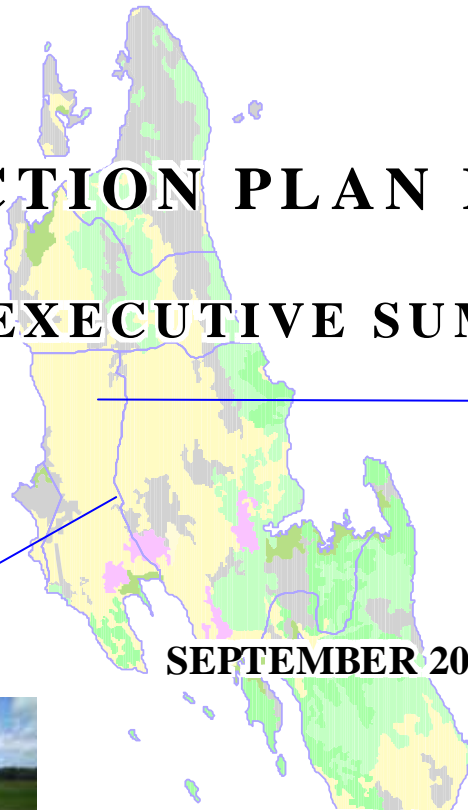


**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF AGRICULTURE, NATURAL RESOURCES,
ENVIRONMENT AND COOPERATIVES (MANREC)**



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

**ACTION PLAN REPORT
EXECUTIVE SUMMARY**



SEPTEMBER 2003

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

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**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
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Exchange Rate
$\text{US\$1.0} = \text{J¥118.23} =$ Tsh. 1,063.70
US\$ = United State Dollars
J¥ = Japanese Yen
Tsh. = Tanzania Shillings
As of July 4, 2003

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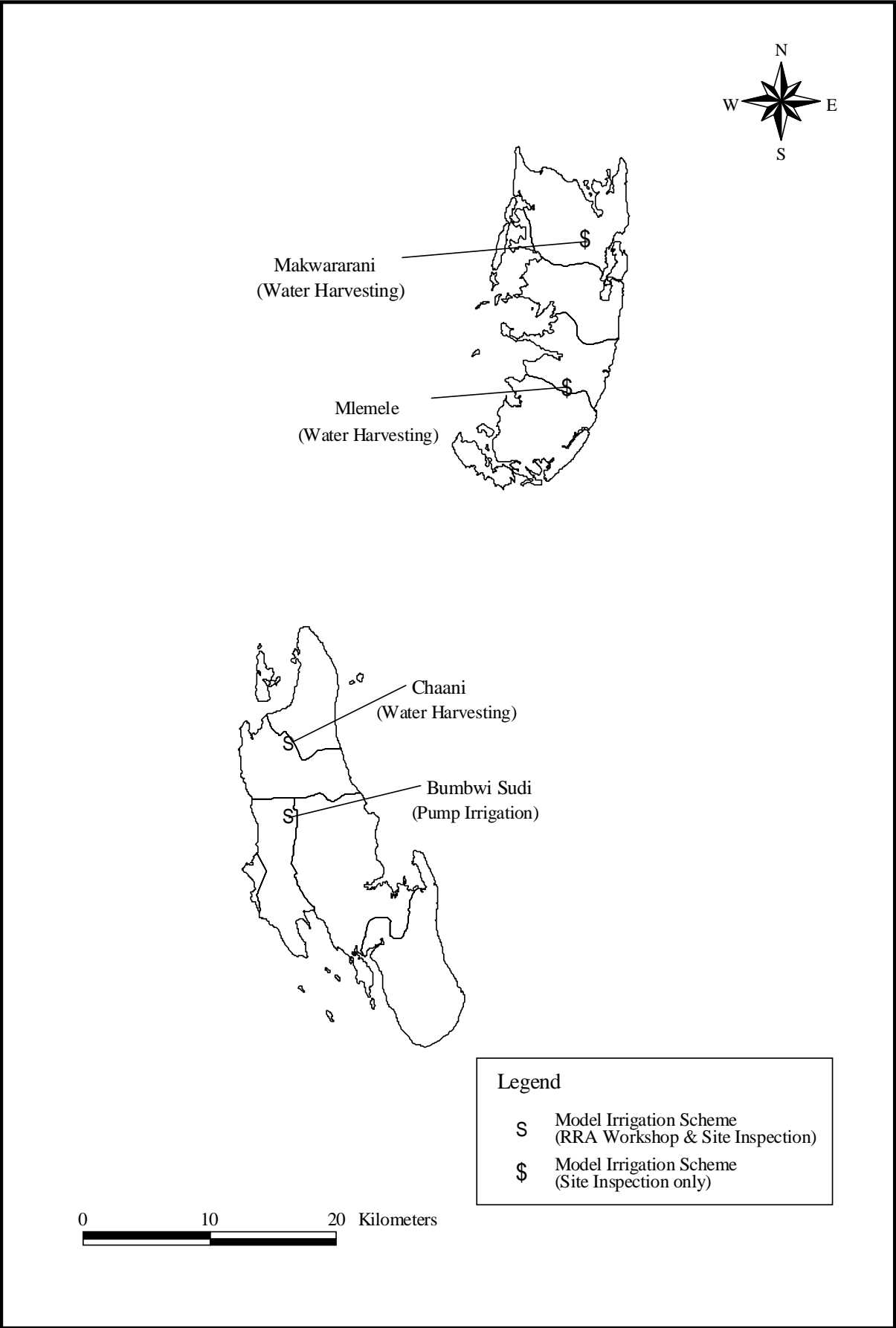
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**THE STUDY
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ACTION PLAN REPORT

EXECUTIVE SUMMARY

1 INTRODUCTION

(1) Authority

This Action Plan Report was prepared in accordance with the Minutes of Meeting agreed upon between the Ministry of Agriculture, Natural Resources, Environment and Cooperative, Zanzibar (MANREC) and the Japan International Cooperation Agency (JICA) on May 9, 2002.

(2) Objectives of the Study

The Study is to be executed phase-wise in three stages of Phase 1 and Phase 2. The Action Plan Report is the product of the Phase 2 Study, presenting the results of problem analysis and the special study for major issues, and action plans for the selected Priority Programmes of the Subject-wise Improvement Programme and 4 Model Irrigation Schemes of the Scheme-wise Development Programme.

(3) Steering Committee Meeting

On December 20, 2002, the Steering Committee meeting was held for the Inception Report 2, attended by staff of the Ministry of Water, Ministry of Finance and Foreign Affairs, and MANREC. Mr. H. Fujjie, the JICA Headquarters, Dr. J. Nozaka, Irrigation Advisor, and Mr.A.H.Simba, MAFS attended the meeting. In the meeting, it was in principle agreed by the Steering Committee. Similarly, the Draft Action Plan Report was discussed at the Steering Committee meeting on August 7, 2003. After discussion on the Draft Action Plan Report with the attendants, it was also agreed by the Steering Committee.

2 DEVELOPMENT PROGRAMME FOR THE YEAR 2020

(4) Development Scenario

In considering the needs of structural reform of the agricultural sector stated in the

ASP, further strengthening of government's and farmers' ownership, and self-reliant irrigation development, the proposed development scenario is the stage-wise development for the 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 2020)
Development Target	To Establish Sustainable Irrigation Development System by 2020		
Key Issue for each Term	Reform	Ownership	Self-reliance
Subject-wise Improvement			
Strategic Approach	<ul style="list-style-type: none"> - Reform of environment for creation of government's ownership and involvement of private sector - Establishment of appropriate technologies on irrigation development in cost-effective concept - Arrangement of environmental issues on irrigation development 	<ul style="list-style-type: none"> - Establishment of irrigation development system under government's ownership - Application of appropriate technologies on irrigation development in cost-effective concept - Establishment of environmental protection method on irrigation 	<ul style="list-style-type: none"> - Establishment of self-reliant irrigation development by private sector and public sector partnership - Establishment of easy access system from farmers on technical support - Spread of environmental protection method established
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 construction of small-scale irrigation and water harvesting schemes		
Expected Annual Growth Rate of GDP	5.0 %	7.0 %	9.0 %

(5) Subject-wise Improvement Programme

The Subject-wise Improvement aims 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 effect by irrigation, (iii) sustaining irrigation efficiency, and (iv) improving irrigation practices when hindered. The Subject-wise Improvement Programme presents 31 programmes consisting of 27 programmes in the Short Term and four programmes in the Medium Term, which were 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 the future, and (v) orderly relation of each programme in consideration of whole context of the Subject-wise Improvement Programme.

List of Subject-wise Improvement Programme in Short Term

No.	Ref.	Programmes
1	I-1	DARI,RADO and DADO Institutional Improvement Programme
2	II-1	DARI Working Mandate Formulation Programme
3	II-2	Regulatory Networking System Establishment between RADO/DAD and DARI
4	II-3	NGO's Intervention in Irrigation Development Encourage Programme
5	II-4	Cooperation Channeling within Irrigation-Sector Establishment Programme
6	II-5	Sub-sectors Coordination System Establishment
7	III-1	Survey and Investigation Guideline Establishment Programme
8	III-2(1)	Planning Guideline Establishment Programme
9	III-2(2)	Designing Guideline Establishment Programme
10	III-3(1)	O&M Guideline Establishment Programme
11	III-3(2)	Monitoring & Evaluation Guideline Establishment Programme
12	III-4	Farmers' Participation in Irrigation Development Programme
13	III-5	Village Irrigation Development Guideline Establishment Programme
14	III-6	Farmers' O&M Manual Establishment Programme
15	III-7	Establishment of DADP Formulation Guideline for Irrigated Agriculture Development
16	IV-1	Technical Manuals Handling Guideline Establishment Programme
17	IV-2	Information and Database Improvement Programme
18	IV-3	Irrigation Development Contractors and Consultants' Listing Programme
19	IV-5	Existing-scheme Monitoring System Establishment Programme
20	V-1(1)	Irrigation Technology Research Center Establishment Programme
21	V-1(2)	Perennial Irrigation Method Improvement Programme
22	V-1(4)	Small Dam Technology for Irrigation Development Establishment Programme
23	V-1(5)	Environmental Assessment Study for Irrigation Practice in Tanzania
24	V-1(6)	Study of River-Basin Approach in Irrigation Development
25	V-3	Farmers' Participation Training Programme
26	V-4(1)	Irrigated Agriculture Training Programme for Rice Production Increase
27	V-4(2)	Irrigated Agriculture Training Programme for Cash Crops Production Increase

List of Subject-wise Improvement Programme in Medium Term

No.	Ref.	Programmes
1	IV-4	LGA Networking System Establishment Programme
2	V-1(3)	Flood Irrigation Development Programme
3	V-2	Hydraulic Experimental Center Establishment Programme
4	V-5	Integrated Irrigation Development Model establishment Programme

Source: JICA Study Team

(6) Scheme-wise Development Programme

A development programme for irrigation schemes was prepared based on the results of priority ranking of inventorized irrigation schemes and review on possibly available financial sources. The development programme was however finally expressed for each term on the development area basis mainly considering the changeable circumstances around irrigation development and flexibility of scheme selection. The inventory survey indicates the 57 irrigation schemes and 8,521 ha of estimated irrigation area. Prioritization of the inventorized irrigation schemes was made in view 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 prioritization of the irrigation schemes and possibly available development budget,

the irrigation development areas for three terms are calculated below:

Accumulated Irrigation Development Area

Development Target at each Term	Short Term	Medium Term	Long Term
	2003 - 2007	by 2012	by 2020
(a) Surface by dam reservoir	356 ha	756 ha	1,349 ha
(b) Surface by diversion weir	90 ha	132 ha	432 ha
(c) Groundwater by pump	178 ha	178 ha	602 ha
Total	624 ha	1,066 ha	2,383ha

Source: JICA Study Team

(7) Cost Estimate for Implementation and O&M

The implementation cost is estimated at US\$ 5.23 million consisting of US\$ 0.46 million for the Subject-wise Improvement and US\$ 4.77 million for the Scheme-wise Development. The required O&M cost for 18 years is US\$ 1.07 million for the government. The farmers' contribution is also estimated at 1.29 million for 18 years on the monetary basis.

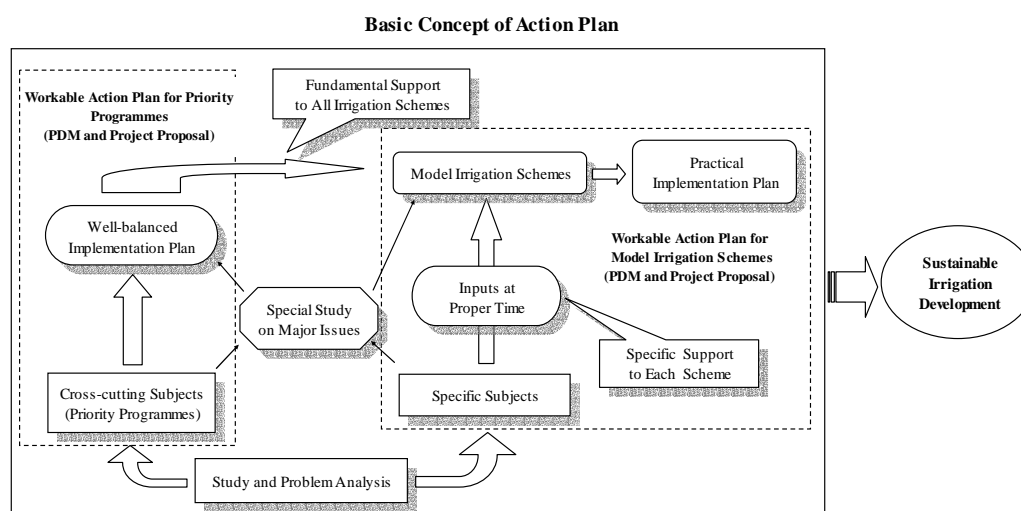
3 OBJECTIVES AND BASIC CONCEPT OF ACTION PLAN

(8) Objectives

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

(9) Basic Concept

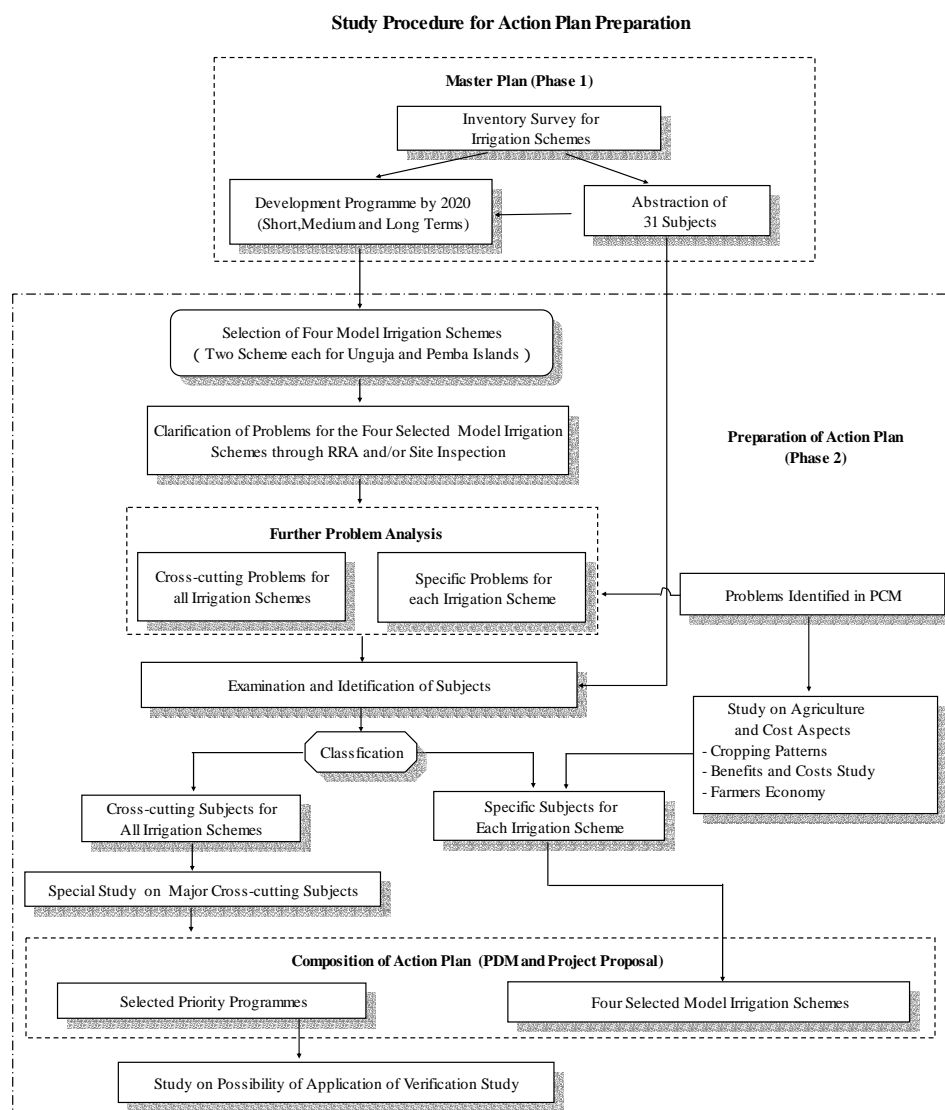
The workable Action Plan for the selected Priority Programmes and Model Irrigation Schemes shall be worked out based on the following basic concept:



- (a) Action Plans are 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) There are plural Priority Programmes and they have a close relationship with each other. Implementation order of each Programme should thus be carefully determined, to heighten the effect of each Programme and finally to strengthen the support to the scheme development.
- (c) Four Model Irrigation Schemes are selected from different irrigation categories, to come up against specific problems. In preparation of the implementation plan for the selected Model Irrigation Schemes, therefore, care should be paid to timely inputs of supporting programmes to settle the specific problems.

(10) Study Procedure for Action Plan Formulation

Based on the said basic approach, the Action Plan for the selected Priority Programmes and Model Irrigation Schemes are prepared in the following study procedure:



(11) 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 of the Subject-wise Improvement Programme, based on the results of RRA and/or site inspection. The four Model Irrigation Schemes are selected from 16 schemes to be implemented by 2020, as was proposed in the Master Plan, based on the following condition and criteria:

Conditions and Criteria for Selection of Model Irrigation Schemes

Condition	Criteria
Two nos. each from Unguja and Pemba islands.	- High demonstration effect to other similar schemes
	- No overlapping with other donors/agencies projects
	- No concentration on specific area and region
	- Good access to the site
	- Availability of topographic maps
	- Adequate data and information by previous study

Table below shows the four Model Irrigation Schemes, which were finally selected under initiatives of MANREC with their expected effects as models

Finally Selected Model Irrigation Schemes

Irrigation Type	Region	District	Scheme Name	Expected Effect as Model
Unguja				
Pump Scheme	Urban-west	West	Bumbwi Sudi	Effective approach to pump scheme in conjunctive use with surface water
Gravity	North	North A Unguja	Chaani	Typical improvement scheme with small dam
Pemba				
Gravity	South	Chake-Chake	Mlemele	Typical new scheme with small dam
Gravity	North	Micheweni	Makwararani	Rehabilitation of traditional scheme at low cost

4 ANALYSIS ON MODEL IRRIGATION SCHEMES AND SELECTION OF PRIORITY PROGRAMMES

(12) Problem Tree and Objective Tree

RRA and/or site inspection were carried out for the four 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 information regarding agriculture. 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" is determined. The analyses identify the common problems and their development approaches follows:

Development Approaches to Common Problems

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

(13) Analysis of Model Irrigation Schemes

The field works mentioned above clarified many problems in each scheme. The clarified problems for each scheme are given below.

Clarified Problems on Institution and Irrigation and Drainage

Scheme	Institution	Irrigation and Drainage
(a) Mlemele	No IA.	No irrigation and drainage infrastructure at present.
	Weak ownership and financial base of farmers.	No experience of dam construction.
		No experience of irrigated farming among farmers.
(b) Makwararani	No registration of IA.	Deterioration of small dam due to inadequate technical consideration during planning and design periods.
	Poor management of IA due to lack of meetings and inadequate understanding on bylaws and regulations by members.	Suspension of irrigation canal construction.
	Poor participation of members in IA activities such as O & M of irrigation facilities and meetings.	No experience of irrigated farming.
(c) Bumbwi Sudi	No registration of IA.	Collapse of some existing boreholes.
	Insufficient management of IA due to no meetings and inadequate understanding on bylaws and regulations by members	Deterioration of some pumping equipment and irrigation canals.
	Poor participation of members in IA activities such as O & M of irrigation facilities and meetings.	Farmers' low awareness for O&M.
		Insufficient capacities of farmers for O&M
		Frequent water distribution conflicts among farmers due to illicit water tapping.
		Damage of canals by livestock.
	Lack of O&M fund.	
(d) Chaani	Registration of IA not to optimal legal form.	Fragile diversion weir to abstract water stably.
	Insufficient understanding on bylaws and regulations by members.	Little experience for irrigated farming among farmers.
	Poor participation of members in the IA activities.	Water conflicts between present irrigators' groups.
	Damage of canals by livestock.	

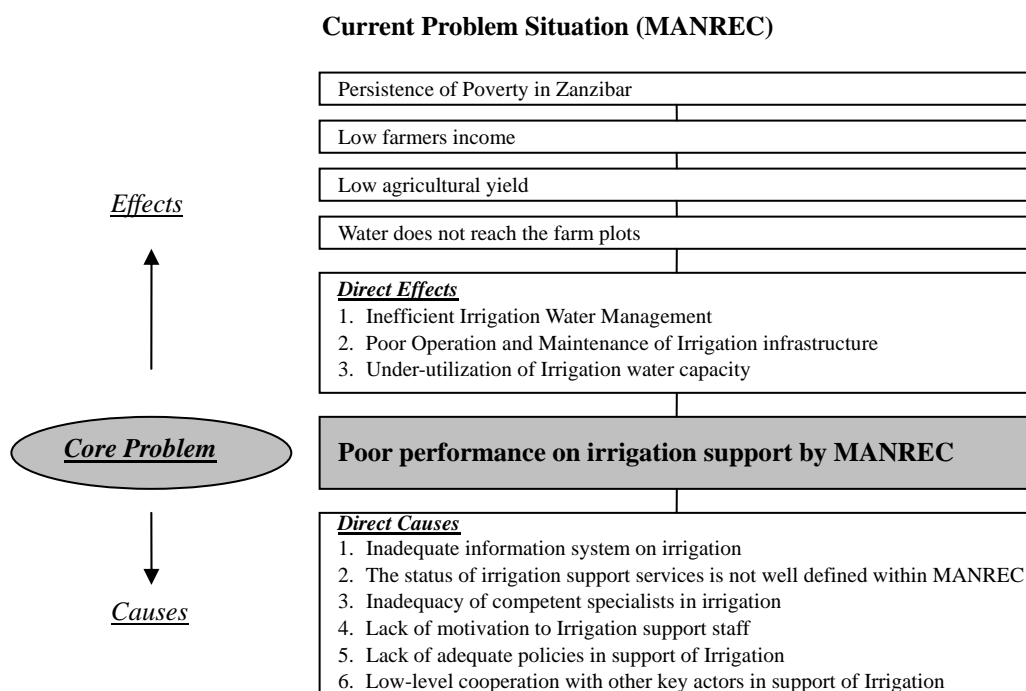
(14) PCM Workshops

PCM workshops were conducted for the irrigation staff of the MANREC and another for the selected farmers and representatives of the IAs from both Unguja and Pemba Islands, aiming to (i) obtain the details of the current problems in irrigation farming in terms of irrigation support, infrastructure and farming practices, and (ii) develop strategies feasible to alleviate the problems in order to foster and sustain the development of irrigation farming.

MANREC

Among the participants, identification of the core problem was carried out as the first step of the PCM workshop. The identified core problem for the MANREC was **“poor performance on irrigation support by MANREC”**.

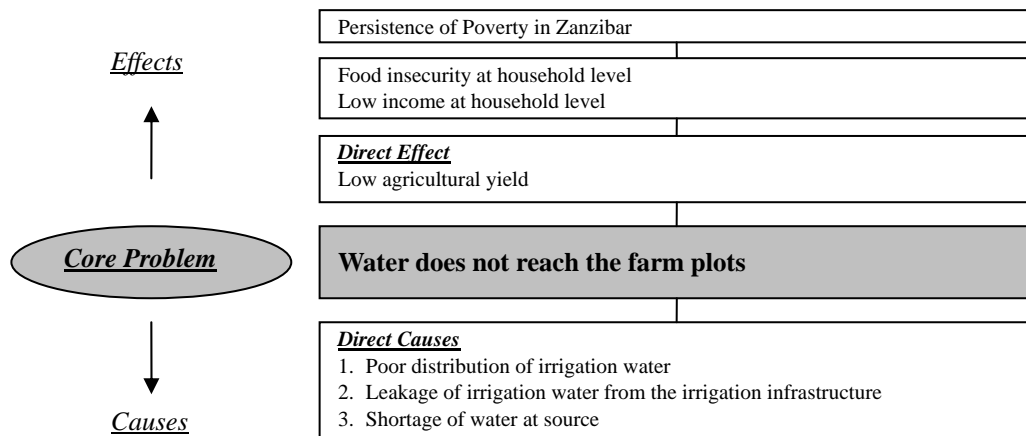
After the identification of the core problem, six direct causes and three direct effects of the core problem were identified. The current problems of the MANREC in irrigation were determined as shown below:



Farmers/IAs

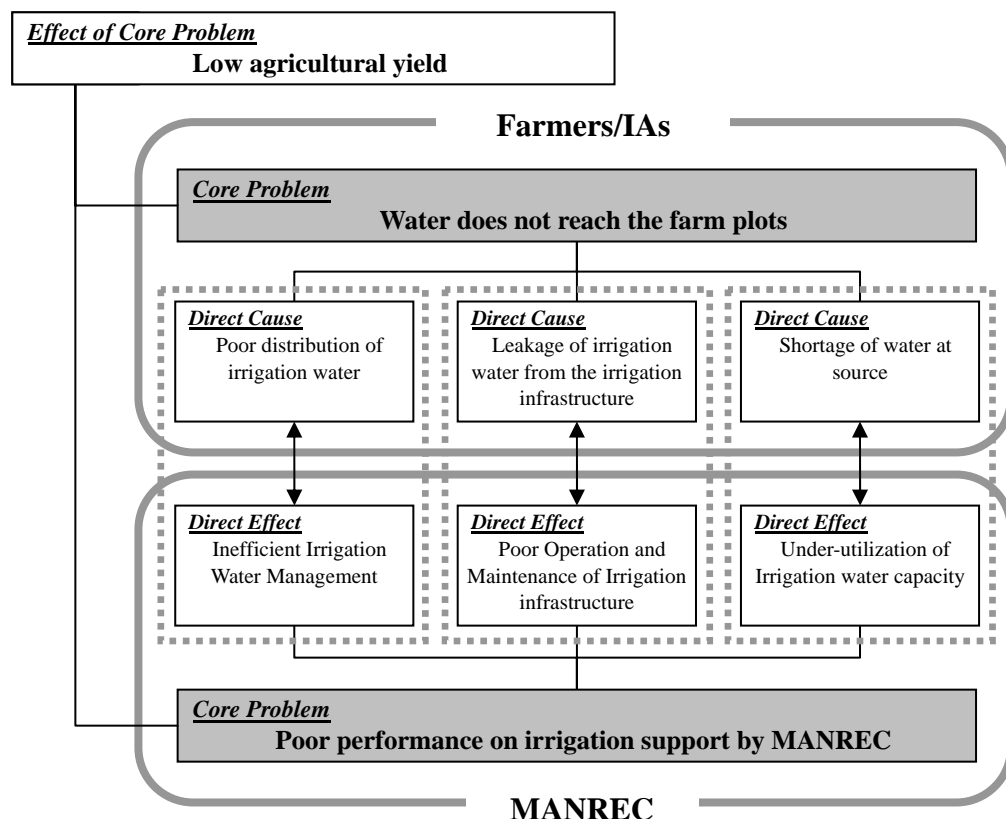
In the same way as the MANREC, the core problem was identified as **“water does not reach the farm plots”**. Further discussions among farmers/IAs from both islands revealed the effects and causes of the core problem, which are shown as follows:

Current Problem Situation (Farmers/IAs)



In comparison between the two PCM workshop results, some interesting relations were identified. In both workshops, in spite of the fact that the core problem was different from each other because the situation is different from the outset level and impact level, “*low agricultural yield*” was identified as one of the effects from each core problem. Furthermore, the direct effects from the core problem of the MANREC are very similar to the direct causes to the core problem of farmers/IAs. Taking into consideration these relations, it is deemed that the two workshop results could be interlocked as illustrated below:

Interlocking of Workshop Results



- (15) Linkage of Identified Issues from PCM workshop, RRA and Site Inspection and Subject-wise Improvement Programme

Institutional Issues

Through the analysis on the problems clarified through field surveys mentioned above, the following appropriate countermeasures were determined:

Summary of Countermeasures for each Scheme

Countermeasures	Scheme			
	Mlemele	Makwararani	Bumbwi Sudi	Chaani
Support for organizing IA	○	○	-	-
Support for IA registration	-	-	○	-
Technical training services for farmers	○	○	-	-
New legal framework for IA	-	-	○	-
Introduction of competitive bottom up approach	○	○	-	-
Technical training of IA management	-	-	○	○
Backstop for bottom up movement by the government	○	○	○	-

Source: JICA Study Team

This table clearly identified that the most common issue for the four selected Model Irrigation Schemes in institutional aspect, was the “Support for bottom up movement by the government”. The examination of the programmes of the Subject-wise Improvement Programme previously identified in the Mater Plan study, was also undertaken, so that the “A-3: IA Strengthening Programme” was added taking into consideration the need of IA strengthening:

Linkage of Countermeasures with Programmes of Subject-wise Improvement Programme

Original Programme	Programme I-1(DARI, RADO and DADO Institutional Improvement Programme)				
	-	-	IA Strengthening Sub-programme		
Additional Sub-programme					
Sub-programmes Added	DARI Reform	Capacity Building Government Staff	IA Organizing & Registration Support Manual	New Legal Framework for IA Establishment Study	IA Management Training Programme for Farmers
Countermeasures					
Support for organizing IA	-	-	○	○	-
Support for IA registration	-	-	○	-	-
Technical training services for farmers	-	-	-	-	○
New legal framework for IA	-	-	◎	◎	-
Introduction of competitive bottom up approach	-	-	-	-	◎
Technical training of IA management	-	-	-	-	○
Backstop for bottom up movement by the government	◎	○	-	-	-

Source: JICA Study Team

Remarks: ◎: 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 Countermeasures for each Scheme

Countermeasures	Scheme			
	Mlemele	Makwararani	Bumbwi Sudi	Chaani
Establishment of proper technical manuals	○	○	○	○
Strengthening roles of MANREC and LGA	-	○	-	-
Continuation of governmental subsidy for pump operation cost	-	-	○	-
Utilization of contractors in proper manner	-	○	-	-
Strengthening roles of LGA	-	-	-	○
Preparation of necessary provisions on IA	-	-	-	○
Establishment of proper O&M manuals	○	○	-	○

Source: JICA Study Team

This table shows that the most common issue for the four selected Model Irrigation Schemes in the irrigation and drainage aspect is the “Establishment of proper technical manuals”.

Selection of Priority Programmes

The Priority Programmes were selected from 34 identified programmes, in consideration of the cross-cutting countermeasures identified in the field investigation and the strategic targets for the Short Term of the development programme presented in the Master Plan, such as (i) reform of the environment for creation of government’s ownership and involvement of the private sector, (ii) establishment of appropriate technologies on irrigation development in a cost-effective concept, and (iii) arrangement of environmental issues on irrigation development. Tabulated below are the 14 selected Priority Programmes:

Selected Priority Programmes among Subject-wise Improvement Programme

No.	Ref.	Programmes
1	I-1	DARI,RADO and DADO Institutional Improvement Programme
2	I-2	IA Organizing and Registration Support Manual
3	I-3	New Legal Framework for IA Establishment Study
4	I-4	IA Management Training for Farmers
5	II-1	Regularization of Irrigation Administration and DARI Working Mandate Formulation Programme
6	III-1	Survey and Investigation Guideline Establishment Programme
7	III-2(1)	Planning Guideline Establishment Programme
8	III-2(2)	Design Guideline Establishment Programme
9	III-3(1)	O&M Guideline Establishment Programme
10	III-4	Farmers' Participation in Irrigation Development Programme
11	IV-1	Technical Manuals Handling Guideline Establishment Programme
12	IV-2	Information and Database Improvement Programme
13	V-1(5)	Environmental Assessment Study for Irrigation Practice in Tanzania
14	V-1(6)	Study of River-Basin Approach in Irrigation Development

5 SPECIAL STUDY ON MAJOR ISSUES IDENTIFIED IN PROBLEM ANALYSIS

(16) Scheme Implementation Process

Until now irrigation schemes were implemented with donors, and the donors are very influential for decision making through almost all processes of scheme implementation in Zanzibar, as shown below:

General Flow of Present Implementation Process

Stakeholders	Scheme implementation process				
	Scheme selection	Site survey and planning	D/D	Implementation	O&M
Donors/NGOs					
DARI					
District Office					
District staff					
Farmers					
Legal entity*					
Contractor**					

Note: The shaded squares on the above matrix means a degree of importance among relevant stakeholders in each implementation process (Strong shade indicates the more important role.).

*: "Legal entity" means a farmers' group which is in force as a legal unit

** : "Contractor" includes contractors who engage in construction works, and consultants who engage in consulting services

On the contrary, general features of the implementation process, especially respective leading actors in each stage of implementation, could be envisaged as shown below:

General Feature of Proposed New Implementation Process

Stakeholders	Scheme implementation process						
	Scheme selection	Site survey and planning	F/S	D/D	Tendering	Implementation	O&M
Donors/NGOs							
DARI							
District Office							
DPDT*							
Farmers							
Legal entity**							
Contractor***							

Note: The shaded squares on the above matrix means a degree of importance among relevant stakeholders in each implementation process (Strong shade indicates the more important role.).

*: "DPDT" means District Project Development Team which is established assigning LGAs staff when scheme is projected

** : "Legal entity" means a farmers' group which is in force as a legal unit

***: "Contractor" includes contractors who engage in construction works, and consultants who engage in consulting services

Taking the new attempts in other countries and possible mainstream of irrigation scheme implementation into consideration, a new process is proposed in the Action Plan. Notable challenges given in the new proposed implementation process

differing from the current method are enumerated from the following three aspects:

No.	Remarkable Points of Improvement in Small Irrigation Scheme Implementation
Strengthening of Institution and Organization	
1	Districts should participate in the process of planning, designing and construction of the scheme
2	Procedures of scheme preparation are to be done in collaboration with DARI and local parties.
3	Formation and registration of a legal entity for the farmers' organization should be commenced as soon as possible after confirming the scheme outline.
4	A sound tendering and award system should be introduced for proper contractor selection.
5	It is pre-conditioned that a tender board consisting of experienced personnel is to be established prior to tendering.
6	Monitoring processes are to be systemized for operation and maintenance after construction works completed
Promotion of Farmers Participation	
7	Farmers participate in the scheme implementation at any stage as satisfying a demand.
8	The routines of participatory cycle management are applied to the implementation process.
9	Farmers contribution has to be considered for any scheme implementation.
10	Farmers contribution should be considered for any scheme implementation through allowable ways of contribution.
Activation of Private Sector	
11	Proper F/S and D/D are carried out by engagement of competent consultants.
12	Engagement of a contractor for the construction works of the scheme is pre-conditioned for scheme implementation instead of force account management.

(17) Irrigators' Association

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

- Insufficient legal framework of IA
- Farmers' insufficient ability or lack of experience of IA management
- Necessity of efficient technical training services for 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-reliable 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 MANREC must become a competent authority of the IA, that is to say, the registrar of the IA.

As for the management of the IA, the following problems have been identified:

- Poor participation of members in the IA activities, such as operation and maintenance activities of 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 of the IA and training program for the leaders are necessary.

(18) Farmers' Participation and Bottom-up Approach

Farmers themselves are the main actors for successful farmers-oriented irrigation development. However, the present situation may be far different from that and the farmers' initiative seems rather weak. A high risk of farming does exist as the fundamental reason for the farmers' passive or defensive attitudes toward a new investment 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
- Natural conditions: severe tropical climate, endemic diseases such as malaria, schistosomiasis, sleeping sickness and etc., relatively low average life expectancy, the spread of HIV/AIDS.	- Poor rural infrastructure: poor condition of irrigation facilities, rural electrification, access roads, domestic water supply, and etc
- Diversity of ethnicity and cultural background	- Instability of macro economy: fluctuation of macro economic environment (inflation rate, foreign exchange rate, interest rate, terms of trade, and etc.)
	- State intervention in economy: suppression of producers' price, and etc.
	- Underdeveloped rural financial institutions for farmers: insufficient means of avoiding high production risk for farmers

Responding to the high risk, the farmers consequently intend to minimize the income fluctuation rather than to maximize the 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 of their ownership to construction of irrigation facilities. Although the hardly manageable factors can not be easily manageable, 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 construction of irrigation facilities

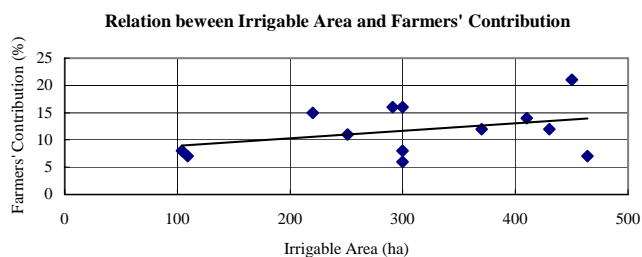
itself is an important countermeasure toward mitigation of such high farming risk and improvement of farmers' income and poverty alleviation. Besides, the following countermeasures should be executed to strengthen the farmers' participation and ownership:

- 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

(19) Farmers' Roles in Scheme Implementation

The farmers play important roles for all stages of scheme implementation. The farmers' contribution to the planning and design stage is to positively take part in meetings, workshops and surveys and investigations executed by the government staff, and to manifest their intentions for the development plan. In the planning stage, an important issue is to firmly ensure the farmers' will on contribution to investment costs and on payment for operation and maintenance cost for the irrigation scheme to be implemented.

The possible minimum contribution from farmers is deemed to be 100% of the unskilled labour and 100% of locally available construction materials. According to the experience of River Basin Management and Smallholder Irrigation Improvement Programme financed by World Bank, the farmers' contribution ranges from 5 to 20% of total construction cost as shown in the graph to the right.



The farmers' contribution at the construction stage is crucial toward the next stage of operation and maintenance, which is the most important for project sustainability. The government should monitor and analyze the condition of farmers' contribution and establish the rules, which should be stated in the Irrigation Regulations.

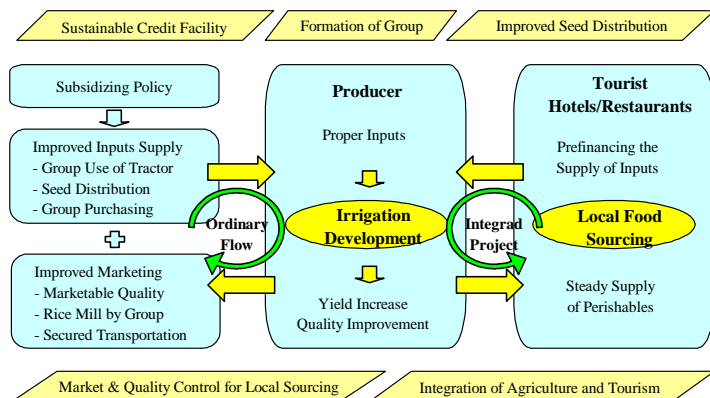
Now, the government transferred all duties on operation and maintenance for irrigation and drainage facilities to the beneficiary farmers groups concerned. Most irrigation schemes, however show a regrettable fact that the operation and maintenance works are not properly conducted by farmers groups, mainly due to lack of farmers' ownership resulting in weak farmers' groups and low collection rates of water charges. It is therefore essential to strengthen farmers' ownership through a participatory approach from the planning time. A preliminary farm budget analysis was conducted for farm households typical in land holding size for

the 4 selected Model Irrigation Schemes. The results show that the required annual O&M cost would occupy only 1 % to 6 % of net reserves after scheme implementation, which is within the affordable extent for them. However, as stated frequently in the Master Plan, the irrigation by itself could not realize a remarkable increase of agricultural production without assistance from other sub-sectors for agricultural inputs, extension services, marketing and micro finance. Therefore, a comprehensive approach should be made in close coordination with other sub-sectors, to increase farm income as planned.

(20) Agricultural Inputs Supply and Marketing of Farm Products

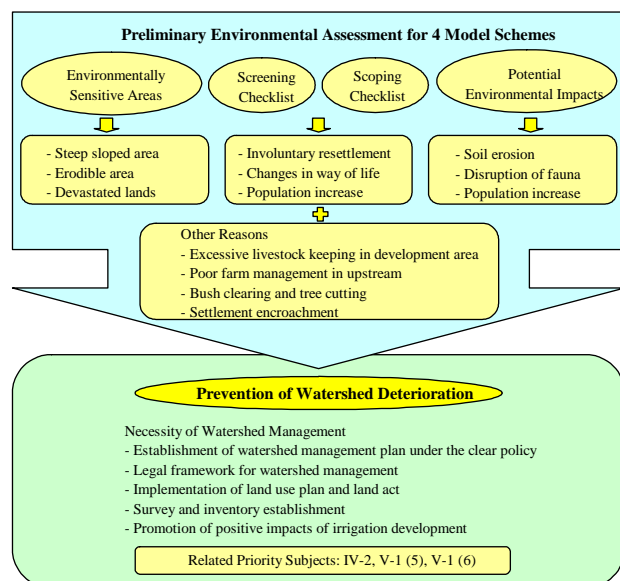
The survey results of the four Model Irrigation Schemes revealed that “Ensuring of Inputs” and “Establishment of Proper Approach to Marketing” are the most common issues as conceivable countermeasures to solve the major problems of farmers in the agricultural aspect. In fact, proper inputs supply and marketing are crucial to uphold the effect of irrigation development. The major recommendations for the improvement of inputs supply and marketing are formation of farmers’ groups, improvement of the paddy seed distribution system, provision of sustainable credit facilities, market and quality control for local sourcing and promotion of integrated agriculture/tourism projects.

The present interrelation between inputs supply/ marketing flow and related support services is summarized in the figure shown on the right.



(21) Environmental Considerations

According to the result of the preliminary environmental assessment for the four Model Irrigation Schemes, the focal points of environmental consideration for the irrigation development were not shown clearly. But the prevention of watershed deterioration was regarded as the most important



issue to secure water resources for irrigation purposes. The proper watershed management can be performed through establishment of policy, plan and legal framework, implementation of a land use plan and land act, survey and inventory establishment and promotion of positive impacts of irrigation development.

(22) Irrigation Regulations

The Irrigation Regulations are essential for optimum management of irrigation schemes. On commencement of the Master Plan implementation, it should be urgently prepared. The articles of the Irrigation Regulations 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 support. The private sector is classified into two parts: IAs and 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 Regulations are therefore required to show concrete descriptions on the functions and duties of both for irrigation development, including farmers' contribution. Then, in consideration of the above-mentioned functions and roles of each agency, effective supervision formation for implementation of irrigation projects should be considered for the following two cases (i) irrigation schemes covering more than one district within one region, and (ii) irrigation schemes located in one district. In any case, it is proposed to establish an irrigation committee. These matters discussed above should be mentioned in the Irrigation Regulations. The private companies will play important role for irrigation development, especially for realizing self-reliant irrigation development. The MANREC in cooperation with relevant government agencies should prepare 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.

6 ACTION PLANS FOR PRIORITY PROGRAMMES AND MODEL IRRIGATION SCHEMES

(23) Basic Concept for Preparation of the Action Plan for Priority Programmes of the Subject-wise Improvement Programme

The basic concept for preparation of the Action Plan 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 creation of government ownership, (ii) involvement of private sector, (iii) establishment of appropriate technologies on irrigation development in cost effectiveness, and (iv) arrangement of environmental issues on irrigation development that are the strategic targets in the Short Term proposed in the Master Plan.

(24) Action Plan for Priority Programmes of the Subject-wise Improvement Programme

Priority Programme	Objectives
(a) DARI, RADO and DADO Institutional Improvement Programme (Code No.I-1)	<ul style="list-style-type: none"> - To diagnose the organizational structures and management of the DARI, RADO and DADO, in particular, focusing on their appropriateness for implementation of ZIMP. - To implement the institutional improvement of the DARI, RADO and DADO based on the diagnosis so that it can execute its mandates successfully.
(b) IA Organizing & Registration Support Manual (Code No. I-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 DADOs 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.
(c) New Legal Framework for IA Establishment Study (Code No. I-3)	<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 Management Training Programme for Farmers (Code No. I-4)	<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.
(e) Regularization of Irrigation Administration and DARI Working Mandate Formulation Programme (Code No.II-1)	<ul style="list-style-type: none"> - To regularize irrigation administration. - To standardize mandates of DARI of MANREC in accordance with the irrigation regulations.
(f) Survey and Investigation Guideline Establishment Programme (Code No.III-1)	<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 rehabilitation irrigation schemes.
(g) Planning Guideline Establishment Programme (Code No.III-2(1))	<ul style="list-style-type: none"> - To establish a comprehensive and practical Planning Guideline which is convenient for planning of both new irrigation schemes and rehabilitation of existing irrigation schemes.
(h) Design Guideline Establishment Programme (Code No.III-2(2))	<ul style="list-style-type: none"> - To prepare a practical Design Guideline which is convenient for fulfilling proper designs for new irrigation schemes and rehabilitation irrigation schemes to fit the site conditions.
(i) Operation and Maintenance Guideline Establishment Programme (Code No.III-3(1))	<ul style="list-style-type: none"> - To prepare a practical Operation and Maintenance Guideline which is convenient for conducting efficient operation and maintenance of irrigation systems.
(j) Farmers' Participation in Irrigation Development Programme (Code No.III-4)	<ul style="list-style-type: none"> - To enhance farmers' participation in irrigation, so that irrigation schemes are properly and continuously managed by farmers themselves.
(k) Technical Manuals Handling Guideline Establishment Programme (Code No.IV-1)	<ul style="list-style-type: none"> - To prepare a teaching source for properly handling all technical references and information, which are definitely important for improving and heightening irrigation technology.
(l) Information and Database Improvement Programme (Code No.IV-2)	<ul style="list-style-type: none"> - To establish or improve information systems and databases related to irrigation development, which are definitely necessary for pursuing irrigation development.
(m) Environment Assessment Study for Irrigation Practice in Tanzania (Code No.:V-1(5))	<ul style="list-style-type: none"> - To conduct environmental assessment studies to correctly justify causal relationships between irrigation water use and environmental issues.
(n) Study of River-Basin Approach in Irrigation Development (Code No.V-1(6))	<ul style="list-style-type: none"> - To conduct a planning study to correctly justify how to introduce a river-basin approach for irrigation water users.

- (25) Basic Concept for Preparation of Action Plan for Model Irrigation Schemes of the Scheme-wise Development Programme

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

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 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 plans of irrigation infrastructure considering farmers' affordability for O & M. - Preparation of agricultural development plans, 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 fees and O & M cost. - Promotion of farmers' participation in project implementation during planning, design, and construction periods.

- (26) Action Plan for Model Irrigation Schemes of the Scheme-wise Development Programme

Common Issues in the Project Design Matrix for each Model Irrigation Scheme

(a) Overall Goal	Improve agricultural productivity and profitability
(b) Project Purpose	Ensure the 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 IA.
	- 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
	- Proceed with 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 to 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

Proposed Infrastructures for each Scheme

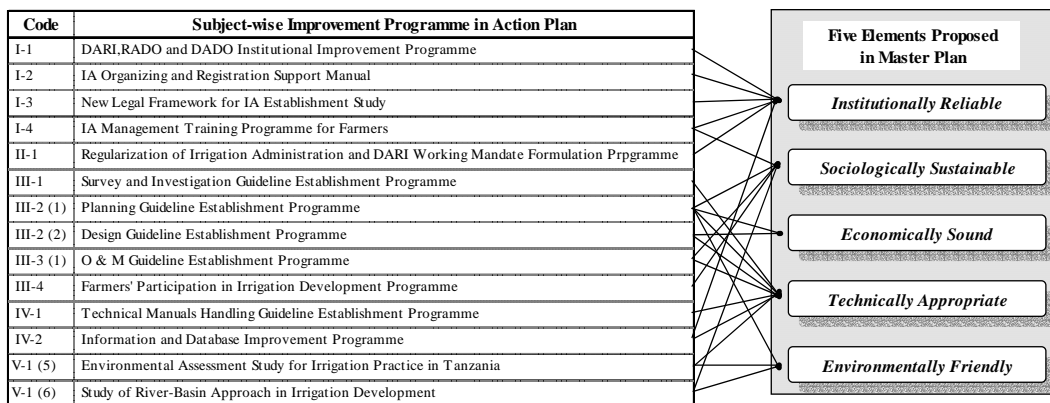
Scheme	Proposed Infrastructures
(a) Mlemele	- Construction of Small earthfill dam (height 3m x length 120 m) - Construction of main irrigation canal (unlined canal with length 7,220 m) - Construction of Drainage canal (unlined channel with length 4,620 m) - Construction of Farm road (length 2,500 m) - Construction of Related structures (Lump Sum)
(b) Makwararani	- Construction of Small earthfill dam (height 2m x length 150 m) - Construction of Main irrigation canal (unlined canal with length 8,950 m) - Construction of Drainage canal (unlined channel with length 14,000 m) - Construction of Farm road (length 1,700 m) - Construction of Related structures (Lump Sum)
(c) Bumbwi Sudi	- Submersible pump installation (rehabilitation of 4 nos. and new installation of 6 nos.) - Bore-hole drilling (new holes of 2 nos.) - Pond (new construction of 2 nos.) - Main irrigation canal with lining (rehabilitation of 2,900 m and new construction of 12,740 m) - Secondary irrigation canal with lining (new construction of 7,300 m) - Drainage canal (new construction of 8,900 m) - Farm road (rehabilitation of 8,900 m and new construction of 5,900 m) - Related structures (Lump Sum)
(d) Chaani	- Construction of Small earthfill dam (height 4m x length 38 m) - Construction of Main irrigation canal (lined canal with length 6,600 m) - Construction of Secondary irrigation canal (unlined canal with length 11,100 m) - Construction of Drainage canal (unlined canal with length 1,600 m) - Farm road (length 6,600 m) - Related structures (Lump Sum)

(27) Implementation Plan

As mentioned above, 14 Priority Programmes were selected from 34 Programmes of the Subject-wise Improvement Programme taking into consideration the strategies for the Short Term Development Programme. The programmes of these

14 selected Priority Programmes are conceived from *Economically Sound, Technically Appropriate, Sociologically Sustainable, Environmentally Friendly* and *Institutionally Reliable* viewpoints.

Relation between Priority Programmes and Five Elements

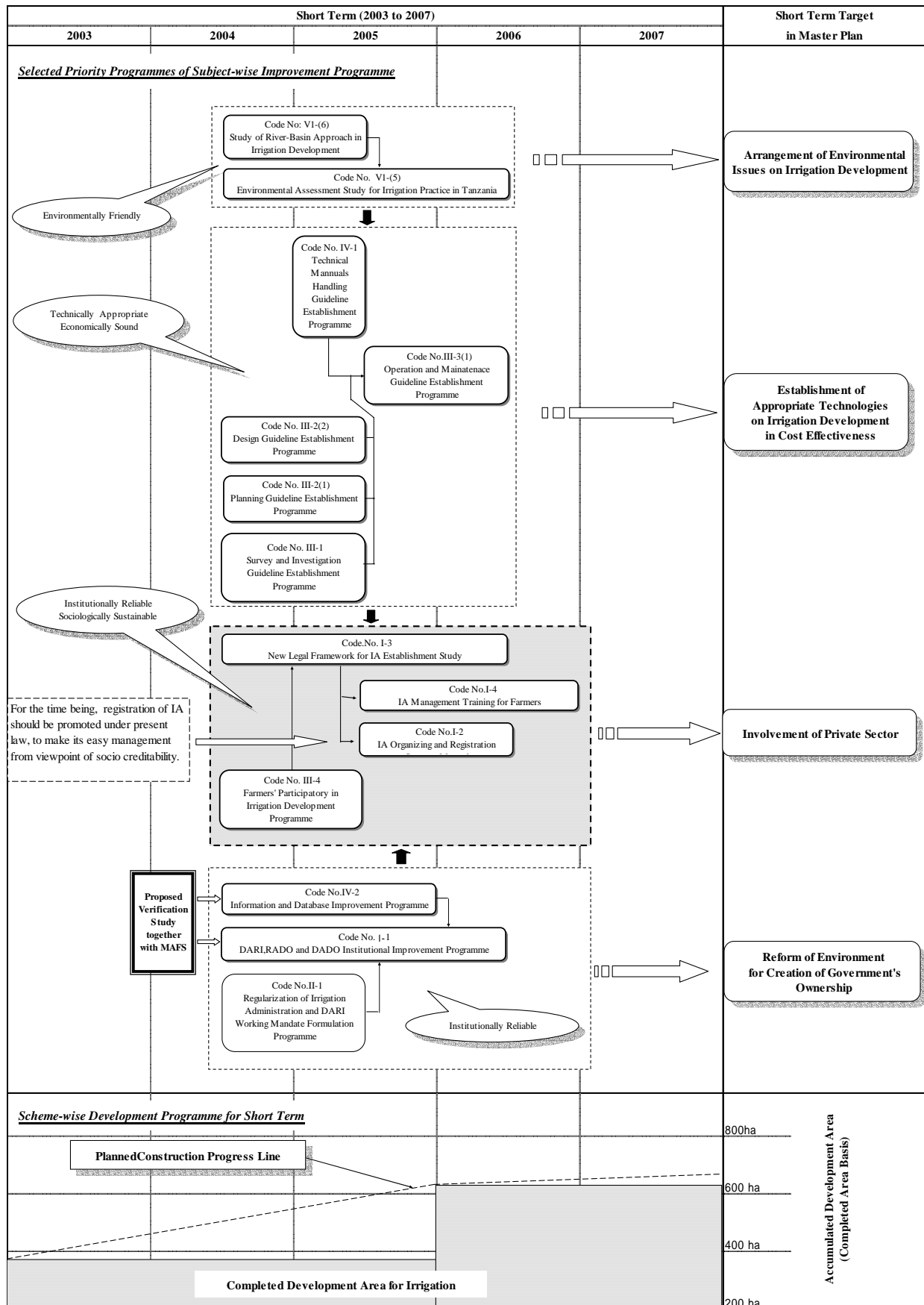


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The implementation plan for them was worked out focusing on (i) commencement of fiscal year when new budget is available, (ii) IA as main actor for irrigation development and (iii) appropriate time of input for each programme to bring out their effect.

The implementation plan for the Scheme-wise Development Plan in the Short Term was prepared on an annual basis. The plan is illustrated on the next page.

Illustrated Implementation Plan



7 RECOMMENDATIONS

(28) Institutional Strengthening of DARI

The DARI is required to have stronger mandates for personnel administration and budget allocation in addition to a stronger institutional and organizational position for fulfilling roles and duties as an executing agency for irrigation development. The Action Plan study gives the implementation of the DARI institutional strengthening programme a high priority due to its important role toward sustainable irrigation development. It is therefore recommended that the DARI institutional strengthening programme should be implemented urgently.

(29) Support on Irrigation Scheme Formation Process to DARI

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. However, through the site inspection for many irrigation schemes and the discussion with MANREC staff, it was found that the development plans of irrigation schemes were not clear, especially from technical and economical viewpoints, and also there were no definite criteria on selection of appropriate irrigation schemes. 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 DARI staff concerned. Besides, it is recommended that a simple data base system should be established at the DARI of MANREC, to make the irrigation scheme formation dependable and the monitoring activities smooth.

(30) Strengthening of IA

IA is a main actor for operation, maintenance and management of irrigation schemes. However, most IAs are too institutionally, financially and technically weak to fulfill the above activities. Following the Master Plan recommendations, the Action Plan study presents the IA Strengthening Programme. It is recommended that the IA Strengthening Programme should be started as early as possible to establish the sound IA, which is indispensable for sustainable irrigation development.