



The United Republic of Tanzania



# The Comprehensive Guidelines

## for Irrigation Scheme Development

Volume 1 Formulation



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# SECTION 1 INTRODUCTION

## Abbreviations

JICA	Japan International Cooperation Agency
A-CBG	Agricultural Capacity Building Grant
ASDP	Agricultural Sector Development Programme
ASDS	Agricultural Sector Development Strategy
ASPS	Agriculture Sector Programme Support
ASPS-IC	Agriculture Sector Programme Support - Irrigation Component
CDO	Community Development Officer
CBG	Capacity Building Grant
CBOs	Community Based Organizations
CMT	Council Management Team
DADG	District Agricultural Development Grant
DADP	District Agricultural Development Plan
DCT	District Core Team
DED	District Executive Director
D/D	Detailed Design
DDP	District Development Plan
DFT	District Facilitation Team
DIDF	District Irrigation Development Fund
DIMU	Data and Information Management Unit
DIDT	District Irrigation Development Team
DITS	Division of Irrigation and Technical Service
DPDT	District Project Development Team
DPLO	District Planning Officer
DIE	District Irrigation Engineer
EBG	Extension Block Grant
EC	Electric Conductivity
EIA	Environmental Impact Assessment
ESA	Environmental Sensitive Areas
ETo	Evapo -Transpiration
EIRR	Economic Internal Rate of Return
FAO	Food and Agriculture Organization (of the United Nations)
FIRR	Financial Internal Rate of Return
F/S	Feasibility Study
GIS	Geographic Information System
GPS	Global Positioning System
HIV/AIDS	Human Immunodeficiency Virus / Acquired Immunity Deficiency Syndrome
ICB	International Competitive Bidding
ISD	Irrigation Scheme Development
IO	Irrigators' Organization
IRR	Internal Rate of Return
ISID	Institutional Support to Irrigation Development Project

LGA	Local Government Authority
LGCG	Local Government Capital Development Grant
LoU	Letter of Undertaking
MAFC	Ministry of Agriculture, Food Security and Cooperatives
MOWI	Ministry of Water and Irrigation
NCB	National Competitive Bidding
NEMC	National Environmental Management Council
NGO	Non-Government Organization
NIRC	National Irrigation Commission
NIMP	National Irrigation Master Plan
O&OD	Opportunities and Obstacles to Development
O&M	Operation and Maintenance
PADEP	Participatory Agricultural Development and Empowerment Project
PAP	Participatory Action Planning
PDS	Participatory Diagnostic Study
PFAC	Planning Financial and Administration Committee
PFC	Planning and Financial Committee
PO-RALG	President's Office - Regional Administration and Local Government
RBM-SIIP	River Basin Management and Smallholder Irrigation Improvement Project
RC	Regional Commissioner
RS	Regional Secretariat
SDPMA	Smallholder Development Programme for the Marginal Areas
SMS	Subject Matter Specialist
SWOT	Strength, Weakness, Opportunity and Threat
TDV	Tanzania Development Vision
TOR	Terms of Reference
TIP	Traditional Irrigation Improvement Programme
UTM	Universal Transverse Mercator
VADP	Village Agricultural Development Plan
VAEO	Village Agricultural Extension Officer
VEO	Village Executive Officer
WAEO	Ward Agricultural Extension Officer
WDC	Ward Development Committee
WDP	Ward Development Plan
WEO	Ward Executive Officer
WFT	Ward Facilitation Team
RIO	Regional Irrigation Office
ZIE	Zonal Irrigation Engineer
ZIO	Zonal Irrigation Office
ZRC	Zonal Review Committee

# Measurement Units

## Extent

$\text{cm}^2$  = Square-centimeters (1.0 cm x 1.0 cm)  
 $\text{m}^2$  = Square-meters (1.0 m x 1.0 m)  
 $\text{km}^2$  = Square-kilometers (1.0 km x 1.0 km)  
ha = Hectares (10,000  $\text{m}^2$ )  
ac = Acres (4,046.8  $\text{m}^2$  or 0.40468 ha.)

## Length

mm = Millimeters  
cm = Centimeters (cm = 10 mm)  
m = Meters (m = 100 cm)  
km = Kilometers (km = 1,000 m)

## Currency

Tsh = Tanzanian Shillings

## Volume

$\text{cm}^3$  = Cubic-centimeters  
(1.0 cm x 1.0 cm x 1.0 cm or 1.0 m-lit.)  
 $\text{m}^3$  = Cubic-meters  
(1.0 m x 1.0 m x 1.0 m or 1.0 k-lit.)  
lit (l) = Liter (1,000  $\text{cm}^3$ )  
MCM = Million Cubic Meter

## Weight

gr = Grams  
kg = Kilograms (1,000 gr.)  
ton = Metric ton (1,000 kg)

## Time

sec = Seconds  
min = Minutes (60 sec.)  
hr = Hours (60 min.)

## Application of the Guidelines

### 1. What are described in the Guidelines?

The Guidelines focus on irrigation schemes development (gravity irrigation schemes, pump irrigation schemes for which the water source is a river, pond/lake, or water harvesting scheme) considering currently available budget for Irrigation Scheme Development (ISD) as well as current experience levels of the district staff. The Guidelines consist of four parts which are "Formulation Guidelines", "Implementation Guidelines", "Operation and Maintenance Guidelines" and "Training Guidelines". The Formulation Guidelines show a quick and practical way of formulating irrigation schemes in the ISD.

These Guidelines on the implementation stage describe how to proceed with each step of the implementation stage of irrigation scheme development (ISD).

The irrigation schemes formulated based on the Formulation Guidelines will be included in the ISD proposal through the procedure of ISD planning and approval within the district. After the ISD proposal is submitted to PO-RALG and the budget for ISD is approved and secured, the irrigation scheme development under ISD will proceed to the implementation stage to be promoted in accordance with the Implementation Guidelines, Operation & Maintenance Guidelines, and Training Guidelines respectively. More specifically, these Guidelines on the implementation stage describe a series of workflow including:

- Participatory action planning
- Registration of irrigators' organization (IO)
- Study and designing
- Tendering and contract awarding, including consulting services
- Construction work
- Operation and maintenance
- Capacity development for the community
- Monitoring and evaluation

In addition, these Guidelines help confirm necessary works and procedures in each step by means of flowcharts and checklists, and help proceed with each step of the implementation stage smoothly.

## **2. Why the Guidelines were prepared?**

Preparation of DADP was launched in 2003 as one of the key activities presented in the Agricultural Sector Development Programme (ASDP) compiled in 2002. However, the ISD proposed by districts did not sufficiently present the appropriateness of their development plans, hence "Preparation of Guidelines for Irrigation Scheme Formulation for ISD" was selected as one of the priority supporting programmes in the National Irrigation Master Plan Study (NIMP) in 2002. In 2006, DADP Guidelines, superordinate guidelines to the Formulation Guidelines, were revised, and in accordance with its revision, the Formulation Guidelines were also revised through the applicability test conducted from March 2007 to June 2007.

This was coupled with a workshop and residential training sessions held from June 2007 to December 2007 on the actual operation of the revised Formulation Guidelines. On the other hand, the guidelines which cover the implementation stage, including design, tendering and construction work, and O&M stage, operation, maintenance and farmers' organization, have been added.

The guidelines aim at:

- Defining necessary works and procedures to proceed smoothly with implementation, operation and maintenance after the ISD formulation and planning stage,
- Helping the Head Of Department dealing with Irrigation(HDI) and other district staff in charge of irrigation scheme development under the ISD to understand the activities to be practiced as government side persons, and
- Helping the Head of Department dealing with Irrigation and other district staff give community members and other stakeholders explanations and advice on necessary activities.

### **3. To whom the Guidelines were prepared?**

The targets of these guidelines are the Head Of Department dealing with Irrigation, District Irrigation Engineer, Irrigation Technician, other district staff and farmers/community who are directly involved in formulation, implementation and O&M of irrigation scheme development. Zonal Irrigation Office/ Regional Irrigation Office (ZIO/RIO) staff are also a primary target of these guidelines because they are in charge of backstopping the districts, giving explanations and instructions on these guidelines to the district staff.

### **4. How the Guidelines were prepared?**

A participatory approach was adopted for the preparation of these Guidelines. The Formulation Guidelines was revised through applicability tests activities in four model districts, the Guidelines were improved by District staff, ZIO/RIO staff and National Irrigation Commission (NIRC). These guidelines on the implementation stage, after being drafted, were improved, revised and finalized through discussions at workshops among district staff, ZIO/RIO staff and other stakeholders, and through the verification study in two model sites.

### **5. What is the special feature of the guidelines?**

The most outstanding feature of these guidelines are: Quick, Systematic and Practical Irrigation Development Planning in ISD for the Formulation Guidelines, and Easy, Practical and Sustainable for the implementation of Irrigation Scheme Development for other Guidelines respectively.



## **Background Information**

### **(1) Authority**

These Guidelines were the revision of the Guidelines for Irrigation Scheme Formulation for DAPD prepared as part of the Verification Study of the NIMP Study in the United Republic of Tanzania in December 2004.

The revision was made taking into account the results of the applicability tests conducted in four districts during the course of implementation of JICA-Technical Cooperation for Formulation and Training of the ISD Guidelines on Irrigation Scheme Development.

### **(2) Background and Objective**

#### **(a) Background**

During the Action Plan Study, site inspection of many irrigation schemes with existing development plans in hand and discussion with district staff of ISD indicated that the development plans of irrigation schemes were not clear, especially from technical and economical viewpoints, and also there were no definite criteria for the selection of appropriate irrigation schemes from those included in Village Plans. To improve this situation, it was essential to prepare and apply some practical guidelines showing the proper steps of formulating schemes to be listed in ISD. The guidelines would, of course, need to be applied to have any effect, so there was a need to provide training in their use to the relevant district staff.

In this regard during formulation the reference should be made in NIMP 2018 for the following considerations; present condition of water, agriculture and irrigation sectors and the data available in the NIRC database as stipulated in masterplan. The Study emphasized that successful irrigation development depends upon good performance of all aspects of irrigation development, such as good planning, good design, good construction, and good O & M. In this sequence of events, the planning of irrigation schemes including selection of appropriate irrigation schemes is the most fundamental activity as a starting point toward successful implementation.

The strategic approach to the Short-term Programme (2003 to 2007) in the Development Programme for the Year 2017 is to reform the environment for the promotion of decentralization of irrigation development. The preparation of the guidelines and provision of related training to the district staff mentioned above duly coincide with this strategic approach.

### **(b) Objective**

The objective of these Guidelines is to provide the district staff with a procedure for irrigation scheme formulation in the preparation of ISD Planning; the procedure consists of quick site inspection, screening, preliminary study, prioritization, evaluation and selection activities.

### **(3) Proposed Entire Process of Irrigation Scheme Development under ISD**

In this section, the entire process of irrigation scheme development is explained in order to clarify the position and roles of the "Guidelines for Irrigation Scheme Formulation for ISD". The entire process is prepared in view of the Guidelines for District Agricultural Development Planning and Implementation, November 2006 the superordinate authorized guidelines to the Guidelines for Irrigation Scheme Formulation for ISD.

Taking into account the above, the process of irrigation scheme development under ISD is designed with the following basic concept:

- List-up of Irrigation Schemes on a "Demand Driven" basis Application of all irrigation schemes should be made by the village government taking into account the real demand of farmers. The Guidelines for ISD indicate the use of O & OD methodology as an effective method of participatory planning, which was endorsed by the Central Government. The Guidelines for Irrigation Scheme Formulation for ISD was prepared in consideration with this O & OD methodology.
- Development of Irrigation Schemes by District Government in a Participatory Process with Farmers. The irrigation scheme development should be carried out in a participatory manner with the involvement of farmers to implant awareness and ownership of the irrigation scheme in their minds. In connection with the participatory

approach, the NIC had prepared the *Guidelines for Participatory Improvement to Farmers Initiated and Managed Smallholder Irrigation Schemes* in July 2003 under ASPS. Thus, the *Guidelines for ISD Formulation* will be elaborated within this larger framework.

#### **(4) Compliance**

All private sectors/person who pursue Irrigation activities. No irrigation work should be constructed until the proposed scheme of the undertaking has been submitted to the Commission for approval and such project is subjected to the environmental impact assessment as provided for under the Environmental Management Act as per National Irrigation Act 2013, section 20(1)(2)(3)(4)(5) and its Regulation 2015(29)

## Terminology for the Guidelines

In these guidelines, the following terms are defined as shown below.

<b>1. Team and Committee</b>	
<i>District Irrigation Development Team (DIDT)</i>	One team formed in the district to facilitate the irrigation scheme development (ISD). The team will be composed of Head Of Department dealing with Irrigation as chairperson, District Irrigation Engineer, Irrigation Technician, Agriculture extension officer, Community development Officer and other relevant staff of the District Office. Participation of Ward leaders, Village leaders, representative farmers, and other stakeholders as determined by district council and NGO will be desirable.
<i>Zonal Review Committee (ZRC)</i>	A ZRC will be formed in each Zonal Irrigation Office/Regional Irrigation office (ZIO/RIO) to assess and endorse the proposed irrigation scheme development (ISD) formulation prepared by DIDT. The team will consist of the Zonal Irrigation Engineer as chairperson and experts in various fields such as irrigation, agriculture, soil science, and environment.
<i>District Council</i>	Council consisting of members of District Assembly.
<i>District Council</i>	Superintending Board for Tendering approved by the District Council.
<i>Tender Evaluation Team</i>	Special Team for Tender Evaluation on District based Tendering consisting of members nominated by the District Council Authority.
<i>Irrigators' Organization (IO)</i>	Association or cooperative society consisting of irrigators in the projected irrigation scheme.
<i>Irrigators' legal entity</i>	Irrigators' organization which has been registered as a legal entity - irrigators' association under National Irrigation Act (NIA).

<b>2. Survey and Planning</b>	
<i>Quick Site Inspection</i>	The site survey to be conducted for all the irrigation schemes in the district to choose high potential scheme(s) for preliminary planning.
<i>Field Survey</i>	The site survey to be conducted for irrigation schemes selected through screening.
<i>Preliminary Planning</i>	The planning for irrigation schemes selected through screening.
<i>Participatory Action Planning (PAP)</i>	The participatory action planning is intended to give an opportunity to all stakeholders of the project to interact to discuss and jointly make a plan of action for preparing the project.

<i>Participatory Diagnostic Study (PDS)</i>	The participatory diagnostic study aims at diagnosis of the opportunities available to the stakeholders as well as the constraints blocking the exploitation of these opportunities to understand current situations which the stakeholders can observe surrounding the scheme and the village.
<i>Participatory Design</i>	The participatory design aims at coming up with the solutions to the problems identified by the irrigators' as a result of the participatory diagnostic study, to confirm their technical feasibility.
<i>Feasibility Study (FS)</i>	The feasibility study forms an integral part of a project proposal, examining the financial, social and environmental feasibility of the project, to enable the ISD financiers to make an investment decision.
<i>Detailed Design /Tender Documentation</i>	The detailed design and the tender documentation aim at defining the detailed specifications of the proposed intervention to permit a final timeframe and cost estimates to be prepared to proceed to the subsequent tendering and procurement procedure.

<b>3. Reports and Documents</b>	
<i>Quick Site Inspection and Screening</i>	The report to be prepared by DIDT describing the results of screening. The report should be submitted to ZRC for assessment and endorsement.
<i>Screening Endorsement Letter</i>	The letter to be prepared by ZRC to endorse the results of screening conducted by district.
<i>Confirmation Letter on the Proposed Area</i>	The letter to be prepared by the village government to confirm that villagers agreed on the selection of the proposed area (area to be considered in the preliminary planning).
<i>Irrigation Scheme Formulation Plan Report</i>	The report to be prepared by DIDT containing all the results of the field survey, preliminary planning, and prioritization of the selected schemes along with the district supporting programme. All completed data forms and maps of the selected schemes should be attached to the report.
<i>Validation and Agreement Letter</i>	The letter prepared by ZRC to validate and agree on the results of the irrigation development planning conducted by the district.
<i>Feasibility Study Report</i>	The report to be prepared by the district, or ZIO/RIO or a private consultant
<i>Detailed Design Report</i>	The report to be prepared by the district, or ZIO/RIO or a private consultant
<i>Tender Documents</i>	The document/forms to be prepared by the district, or ZIO/RIO or a private consultant entrusted by the district.

<b>4. Map</b>	
<i>Village Resource Map</i>	The map prepared by villagers showing resources of the village, such as river, agricultural land etc.
<i>Present situation Map</i>	The map prepared by DIDT based on the village resource map. It shows also resources, but their exact locations (coordinates) are measured by handheld GPS
<i>Scheme Development Map</i>	The map prepared by DIDT based on the present situation map. It shows village resources but also the locations of any proposed intakes,

<b>5. Area</b>	
<i>Potential Area</i>	Total area which is technically feasible, economically and financially profitable, socially viable, and environmentally acceptable that is irrigated or capable of being irrigated on the bases of water availability, land availability, and suitability.
<i>Cultivated Area</i>	The area currently cultivated in the potential area.
<i>Present Irrigated Area</i>	The area currently irrigated in the cultivated area.
<i>Present Rainfed Area</i>	The area currently not irrigated in the cultivated area.
<i>Proposed Area</i>	The area to be considered in preliminary planning. The area should be selected by villagers as the first priority area in the field survey meeting, and a confirmation letter on the proposed area shall be sent to the district office by the village government.
<i>Irrigable Area in Rainy Season</i>	The area that can be irrigated in the wet season.
<i>Irrigable Area in Dry Season</i>	The area that can be irrigated in the dry season.
<i>Development Area</i>	The area to be developed (area to be provided irrigation and drainage facilities).
<i>Command Area of the Main Canal</i>	The area irrigated from the main canal. Normally, it is the same as the development area, except when the proposed development is an extension of an existing canal. For an extension scheme, the command area of the main canal consists of the existing area plus the development area (extension area).

## 6. Irrigation System

<p><i>Irrigation Scheme</i></p>	<p>Any irrigation system that meets one of the following is recognized as a single irrigation scheme:</p> <ol style="list-style-type: none"> <li>1) The irrigation system has several canals conveying water from one intake.</li> <li>2) The irrigation system has several intakes but the canals from the intakes are connected.</li> <li>3) The irrigation system has several intakes with scattered canals but the intakes and canals are situated within one or more village.</li> </ol>
<p><i>Traditional Irrigation Scheme</i></p>	<p>Irrigation schemes that have been initiated and operated by farmers themselves, with no intervention from external agencies.</p> <div data-bbox="596 698 1225 1167" data-label="Image"> </div> <p style="text-align: center;">Traditional Irrigation Scheme</p>
<p><i>Improved Traditional Irrigation Schemes</i></p>	<p>Irrigation schemes that have been initiated and operated by Semi-subsistence farmers themselves and on which there has subsequently been some intervention by an external agency in the form of construction of a new diversion structure.</p>
<p><i>Modern Irrigation Schemes</i></p>	<p>Formally planned, designed and fully developed smallholder scheme in which full irrigation facilities have been provided by external agencies with or without some contribution from the beneficiaries, and in which there is usually a strong element of management provided by the government or other external agency.</p>
<p><i>Water Harvesting Schemes</i></p>	<p>Irrigation schemes that subsistence farmers have themselves introduced using simple techniques to artificially control the availability of water to crops. Includes flood recession irrigation schemes.</p>

## 7. Type of Irrigation Scheme

<i>Gravity</i>	An irrigation scheme in which water is supplied to agricultural land only with gravity force.
<i>Pump (river)</i>	The irrigation scheme for which the water source is a river and water is abstracted through pump.
<i>Pump (lake/pond)</i>	An irrigation scheme for which the water source is a lake/pond and water is abstracted through pump.
<i>Rain water harvesting</i>	An irrigation scheme that subsistence farmers have themselves introduced using simple techniques to artificially control the availability of water to crops. Includes flood recession irrigation schemes.
<i>Groundwater</i>	An irrigation scheme in which the water source is groundwater. Groundwater irrigation is not handled in the guidelines, since it needs special hydro-geological study. It is recommended that groundwater irrigation schemes be formulated in consultation with the ZIO/RIO.
<i>Dam</i>	An irrigation scheme in which a dam is the water source. Dam irrigation is not handled in the guidelines, since it requires special engineering studies. It is recommended that dam irrigation schemes be formulated in consultation with the ZIO/RIO.
<i>Treadle pump</i>	A treadle pump is a pump to lift water by pedal power. Treadle pump irrigation is not handled in the guidelines as it should be installed by farmers themselves, not the district government. However, promotion of treadle pumps can be emphasized and proposed in the ISD.

<b>8. Required Works</b>	
<i>Rehabilitation</i>	Works to recover the function of existing irrigation and drainage facilities up to the original level without changing irrigation system (not changing traditional or improved traditional system to a modern system).
<i>Improvement</i>	Works to enhance the function of existing irrigation and drainage facilities by changing the irrigation system (changing traditional or improved traditional system to modern system).
<i>New Development</i>	Works to develop a new irrigation and drainage system by providing new facilities (new irrigation and drainage facilities provision for a scheme where there are no existing facilities).
<i>Extension</i>	Works to extend the irrigation area from an existing upstream area to a non-developed downstream area.

<i>Drainage</i>	Works to improve the drainage condition of the scheme by providing new drainage facilities or improve existing drainage facilities without providing irrigation facilities (no irrigation works, only drainage works).
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### 9. Interview Survey

<i>Household</i>	A family unit managed under one financial control.
<i>Anticipated negative impact</i>	A bad influence that might occur because of a proposed irrigation development. Environmental problems not related to irrigation development (such as soil erosion under rainfed condition) are not "anticipated negative impact".
<i>Water conflict within the scheme/village</i>	Competition for limited water resources among villagers within the same scheme or village.
<i>Water conflict between other schemes/village</i>	Competition for limited water resources between different schemes or different villages.
<i>Land conflict</i>	Competition for limited land resources among villagers or between agriculturists and pastoralists.

### 10. Equipment

<i>Handheld Global Positioning System (GPS)</i>	<p>Equipment used to identify the geographical location of a point using satellite positioning. Horizontal measuring error of handheld type GPS is about 5-15 m, so while not suitable for measuring very small areas, handheld GPS is good enough for irrigation scheme formulation.</p>  <p>A Type of Handheld GPS</p>
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<p><i>Handheld Electric Conductivity (EC) Meter</i></p>	<p>Equipment used to measure salinity, one of the major factors of water quality that must be checked. If salinity of the water is high, the EC meter shows a high value (high salt concentration).</p>  <p>A Type Handheld EC Meter</p>
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<p><b>11. Database System</b></p>	
<p><i>National Irrigation Database</i></p>	<p>A database system that has been established in the National irrigation Commission (NIRC) for storing information about irrigation. It has four major functions: 1) Input data, 2) Output data, 3) Scheme maps and 4) library. Data and information stored in the database can be provided to users of the guidelines upon request to NIRC</p>
<p><i>Irrigation Geographic Information System (GIS)</i></p>	<p>A system established specifically for irrigation in the NIRC. It was prepared mainly using materials employed for the analysis of the potential Area for irrigation development. It consists of information on various types of general features (administration boundaries, rivers, and roads) along with more specific information such as agro-ecological zones, protected areas, land cover, land units and soil types. It can therefore be utilized for evaluating the irrigation potential of a proposed scheme. Data and information stored in the GIS can be provided to users of the guidelines upon request to the NIRC.</p>

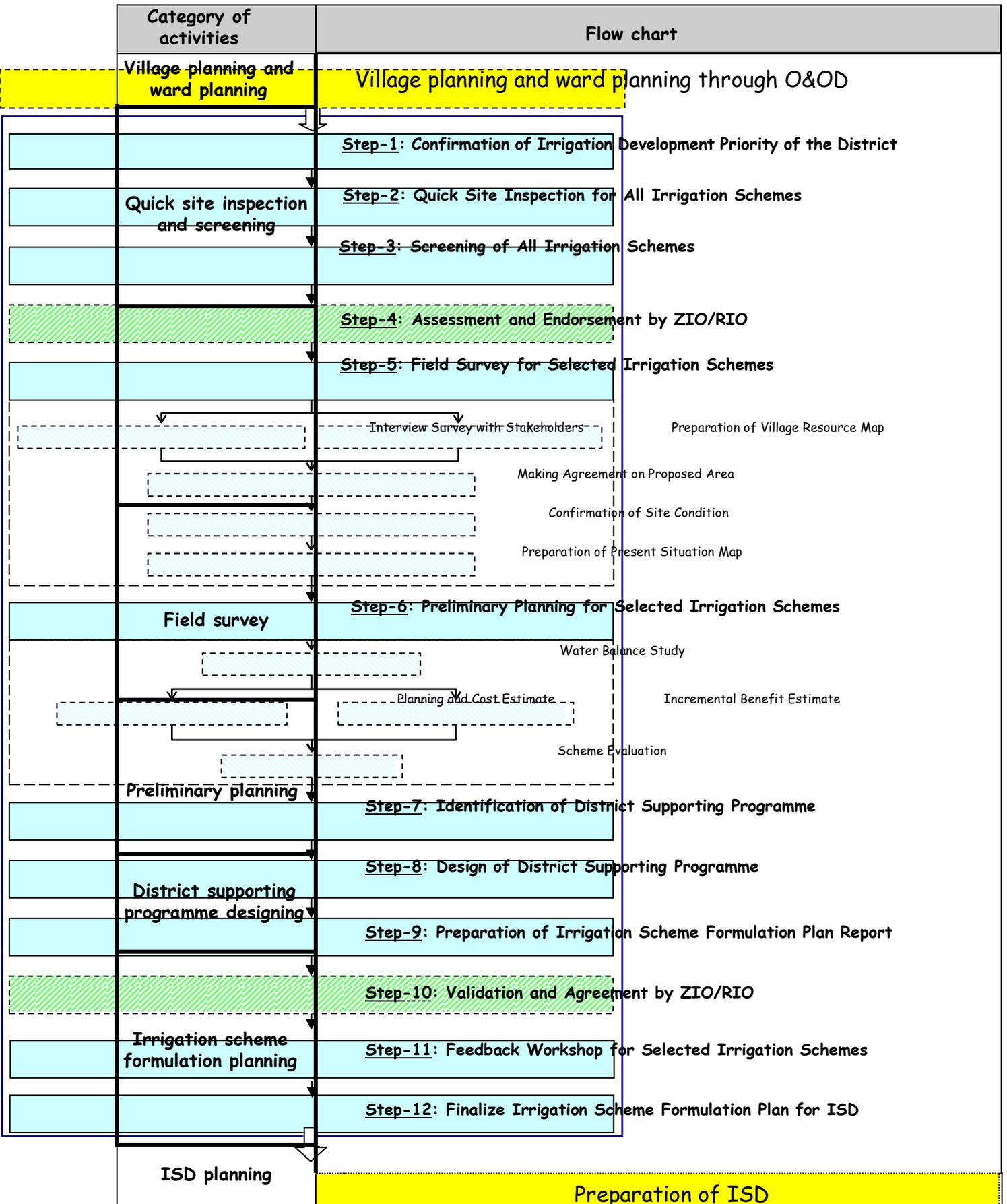
## 12. Reference Materials

*Environmental Site  
Hand Book*

The objective of this Environmental & Social Considerations - Site Handbook is to provide the all stakeholders engaged in the irrigation scheme projects with a tool on how to formulate and implement sound projects that reduce adverse environmental, social and health impacts.

# **SECTION 2 STEPS**

# Flow of Irrigation Scheme Formulation



## Main Format for Steps

This section, Section 3: Irrigation Scheme Formulation for ISD, is the main body of these guidelines. It presents a series of steps for undertaking the scheme formulation work. Each step is presented using the following format.

<b><u>Main Format</u></b>	
<b>Step-#: Title of Step</b>	
<b><u>Key Message</u></b> Messages for the step	
<b><u>Why is the work required?</u></b>	
Explanation of importance the work.	
<b><u>Key for the success of the work</u></b>	
Elaboration of means of reaching the target.	
<b><u>Required inputs</u></b>	
Identification of the required inputs for the work, e.g development team, material, equipment, relevant document and information.	
<b><u>How is the work carried out?</u></b>	
<b><u>Sub-step 1 Title of sub-step 1</u></b>	<b><u>Description of procedures for sub-step 1 work</u></b>
Sub-step 2 Title of sub-step 2	Description of procedures for sub-step 2 work.

1. First, carefully read the "Key Message", "Why is the work required?", and "Key for the success of the work" to fully understand the work.

2. Next, read "Required inputs" and confirm who is responsible for the work. If there are any materials and equipment required, obtain them before starting the work.

## 2. Indicator for Application of the Work

In some situations, not all the work needs to be conducted. For example, measurement of lake/pond capacity is not required if the water source of the scheme is not a lake/pond. If you encounter the following indicator, confirm whether the work is required or not before starting the work.

If there is no circle, the work is not necessary. In this example, work for pump (lake/pond) or drainage development scheme is not required

### Indicator for Application of the Work.

<b>Sub-step 1 Title of sub-step 1</b>	
Applicability The sub-step should be applied to circled type of scheme	
1) Type of irrigation	
<input type="checkbox"/> Gravity	<input type="checkbox"/> Pump (Lake/pond) <input type="checkbox"/> Rain water harvesting
2) Type of irrigation development	
<input type="checkbox"/> Rehabilitation	<input type="checkbox"/> Improvement <input type="checkbox"/> New Development <input type="checkbox"/> Extension <input type="checkbox"/> Drainage

## Step-1: Confirmation of Irrigation Development Priority of the District

### Key Message

Confirmation of district irrigation development priority which is well harmonized with district local situation and National Irrigation Development Policy

### Why is the work required?

Irrigation schemes should be prioritized based on the irrigation development priority of the district (General direction for irrigation development in the district).

### Key for the success of the work

The district local situation should be assessed carefully and the general direction of irrigation development in the district should be determined taking the national irrigation development policy into consideration.

### Required inputs

1. District Irrigation Development Team (DIDT)
2. Summary of National Irrigation Master Plan (NIMP) (see **Attachment-2**)
3. Agriculture Sector Development Programme (ASDP) report.
4. ISD report.
5. Form for listing irrigation schemes in the district (**Form-1**)

### How is the work carried out?

Sub-step 1 Organize the District Irrigation Development Team	The District Irrigation Development Team (DIDT) will be composed of Subject Matter Specialist (SMS) for irrigation, SMS for agriculture, extension officer, and other relevant staff of the District Office.  DFT will decide DIDT members from DFT members or other persons. Zonal staff is fully involved in DIDT for the first trial of the district's formulation activities. From the second trial, zonal staff assists the district upon request from the district. Zonal staff's involvement shall be covered by ASDP central level budget.
Sub-step 2 Prepare a list of irrigation schemes from O&OD practices	See <b>Form-1</b> . This will be the basic inventory of irrigation schemes which are given priority in village plans and ward plans through O&OD practices in the district.
Sub-step 3 Review agriculture sector development programme (ASDP)	Review ASDP and confirm the role of the irrigation sub-sector development within the agriculture sector development programme.
Sub-step 4 Review National Irrigation Master Plan (NIMP)	Review NIMP and confirm the role of the District in the irrigation development of the country in order to achieve the target specified in the Master Plan (see <b>Attachment-2</b> ).
Sub-step 5 Study the present status of irrigation activities in the District	Study the present status of irrigation activities through careful examination of data and documents the district owns. Problems and constraints to irrigation development in the District will thus be revealed and the necessary countermeasures should be elaborated.
Sub-step 6 Prepare irrigation development priority of the District	The general direction of future irrigation development should preferably be established as a District priority based on the constraints and countermeasures mentioned above. DIDT members should at least reach a consensus on the District irrigation development priority.

## Step-2: Quick Site Inspection of All Irrigation Schemes

### Key Message

Confirm current conditions of irrigation schemes at sites with relevant information and check list in hand

<u>Why is the work required?</u>	
To make a rough site check on the reliability of information on irrigation schemes listed in the Ward Plan is a prerequisite for successful irrigation planning within a limited time.	
<u>Key for the success of the work</u>	
In this stage, it is not necessary to make a detailed inspection. The site inspection should be conducted to confirm that the irrigation schemes with conditions as reported in Ward Plan exist. For that purpose, a survey sheet to be filled in during the inspection is a useful tool.	
<u>Required inputs</u>	
<ol style="list-style-type: none"> <li>1. District Irrigation Development Team (DIDT)</li> <li>2. Survey Sheet for Quick Site Inspection (<b>Form-2</b>)</li> <li>3. Handheld GPS, Handheld EC meter and Handheld pH meter</li> <li>4. Camera (if available)</li> </ol>	
<u>How is the work carried out?</u>	
Sub-step 1 Carry out preparatory works, before visiting the sites	<ol style="list-style-type: none"> <li>1) Obtain important pre-information (such as inventory survey result, soil type, land cover, agro-ecological zone, protection area, 1:50,000 topographical maps, etc.) From institutions concerned.</li> <li>2) Acquire handheld GPS, EC meter and handheld pH meter.</li> <li>3) The possibility of having water rights related to the water resources should be checked at the water office concerned.</li> <li>4) Prepare site inspection schedule.</li> <li>5) Inform relevant village chairpersons about the quick site inspection schedule and ask them to invite stakeholders, such as irrigators' organization (IO) chairpersons and some villagers.</li> </ol>
Sub-step 2 Visit the scheme site	Visit the scheme site according to the prepared site inspection schedule.
Sub-step 3 Conduct an interview with villagers	Collect personnel concerned such as village chairperson, organization chairperson and farmers. Conduct an interview survey using the survey sheet.
Sub-step 4 Inspect the potential area (or present irrigated area)	Visit potential (or present irrigated) area together with the villagers concerned. Collect further data in the field and confirm the information obtained during the interview. Measure coordinates of the location by handheld GPS (GPS is available in ZIO/RIO).
Sub-step 5 Inspect the water source of the scheme	Visit the water source of the scheme together with the villagers concerned. Measure water quality by handheld EC meter and handheld pH meter. Collect further information about flood and drought conditions and try to understand whether the resource is enough for the proposed potential area.
Sub-step 6 Complete the survey sheet and examine the reliability of information at site	Examination of reliability of information should be made at site, to avoid further inspection as much as possible.

**Note: Indicative time required for the quick site inspection is 1-2 hours/scheme (excluding travel time).**

## Step-3: Screening of All Irrigation Schemes

### Key Message

Screening of irrigation schemes based on rational and transparent criteria under ownership of district government.

### Why is the work required?

All irrigation schemes listed in Village Plans could not proceed to further study in the limited time and budget, so that their screening is required.

### Key for the success of the work

Well-designed criteria that are appropriate to local conditions and district priorities as well as National policy are indispensable for successful screening work.

### Required inputs

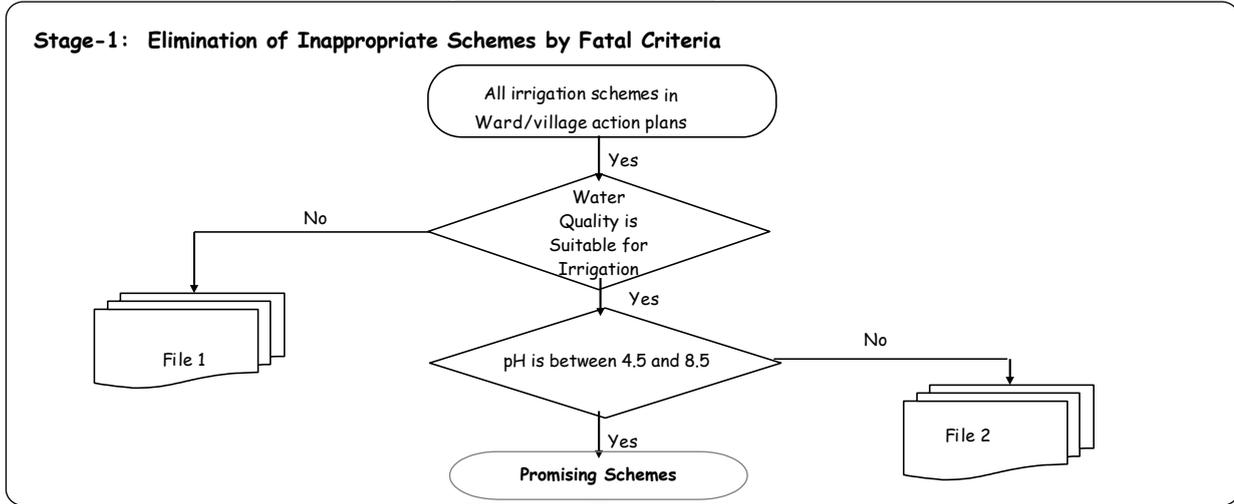
1. District Irrigation Development Team (DIDT)
2. Result of the Quick Site Inspection (data filled Form-2)

### How is the work carried out?

Sub-step 1 Arrange meeting for screening	The participants at the meeting are the members of DIDT, and Head of department dealing with irrigation. The staff of <b>ZIO/RIO</b> and NGO will participate as observers if available.
Sub-step 2 Study sample screening flow, and revise it as required	See <b>Figure-1</b> . This screening flow is an example, and may be changed based on local conditions and district priorities. DIDT will therefore study the sample screening flow.
Sub-step 3 Screen the irrigation schemes confirmed through site inspection based on the screening flow	DIDT will carry out the screening in order to determine the schemes for proceeding to the next step. This process will be carried out in 3 stages; the 1 <sup>st</sup> stage to reject inappropriate schemes by fatal criteria, the 2 <sup>nd</sup> stage to prioritize according to the potential of the scheme, and the 3 <sup>rd</sup> stage to reconsider the particular circumstance of each scheme. Careful attention should be paid to the treatment of irrigation schemes filed (see screening flow on next page) as using pump, seasonal river or rain as the
Sub-step 4 Prepare the quick site inspection and screening report on screening work including its results	DIDT will prepare the quick site inspection and screening report by compiling the results of screening work. If irrigation schemes using pump, seasonal river or rain water harvesting are selected, the reasons should be clearly mentioned in the report. The report will also mention any problems in using the criteria if any, and should be reflected in the next screening work.  Format of the quick site inspection and screening report is prepared and attached in Supplementary Explanation.
Sub-step 5 Submit the report to the <b>ZIO/RIO</b>	DIDT will submit the abovementioned report to the <b>ZIO/RIO</b> along with the survey sheet of each scheme and <b>fill form -15</b> for assessment and endorsement.

**Note: If there is continuous works for phase-wise development scheme, continuation of such works should be the first priority.**

**Figure-1 Flow of Screening**



**Stage-2: Prioritization according to the Potential of Schemes by Comparable Criteria**

Criteria	Point allocation (Maximum point)	Score of each	Scheme				
			A	B	C	D	E
(1) Technical assessment			-	-	-	-	-
(a) Water resources	15						
Perennial river		15					
Dam		10					
Others		5					
(b) Potential area	10						
Less than 500 ha		10					
Between 500 to 2000 ha		7					
More than 2000 ha		5					
(c) Irrigation type	15						
Gravity		15					
Rain water harvesting		10					
Pump		5					
(2) Farmers' motivation	30						
High		30					
Medium		20					
Low		10					
(3) Social and economic			-	-	-	-	-
(a) Marketing	10						
Linked with		10					
Not linked with		5					
(b) Scheme access road	10						
Good enough		10					
Not good enough		5					
(c) Anticipated conflict due to land, water, etc	10						
Not anticipated		10					
Anticipated		5					
Total	100						



**Stage-3: Consideration of Particular Circumstances of Priority Schemes**

**Sample of Particular Circumstances to be considered**

- 1) Budgetary Limitation, if the cost is expected to exceed the conceivable budget, some arrangement might be needed.
- 2) Existing Support if the scheme is already supported by certain fund, special consideration might be needed.
- 3) Environmental problem, if the scheme is anticipated to be affected by environmental problems, special attention should be paid.

Note: a) Higher scoring schemes do not necessarily have to be selected as candidates for ISD if there is a clear reason not to select them.  
 b) The particular circumstances of each scheme should be carefully compared and examined among priority schemes.



## Step-4: Assessment and Endorsement by ZIO/RIO

<p><b><u>Key Message</u></b> Execution of assessment and endorsement with objectivity and transparency.</p>	
<p><b><u>Why is the work required?</u></b></p>	
<p>Screening work calls for objectivity and transparency. In this sense, assessment and endorsement by a third party is absolutely necessary.</p>	
<p><b><u>Key for the success of the work</u></b></p>	
<p>The ZIO/RIO should assess and endorse the results of screening from an overall viewpoint. The ZIO/RIO should thus organize a specific review team to keep a consistent approach to assessment and endorsement works within any district.</p>	
<p><b><u>Required inputs</u></b></p>	
<p>1. Zonal Review Committee (ZRC) 2. Report on screening criteria and results</p>	
<p><b><u>How is the work carried out?</u></b></p>	
<p>Sub-step 1 Organize the review committee.</p>	<p>The review committee should consist of staff specializing in various fields such as Engineering, agronomy, Geomatics, Sociology, Environmental and other related fields be chaired by the Zonal Irrigation Engineer.</p>
<p>Sub-step 2 Review the report on results of screening.</p>	<p>The review should focus on the following items:</p> <ul style="list-style-type: none"> <li>- Explanation of any irrigation schemes using pumps, seasonal river or rain water harvesting</li> <li>- Applied information for each irrigation scheme</li> <li>- Procedure of screening including score calculation</li> </ul>
<p>Sub-step 3 Clarify unclear parts in the submitted report.</p>	<p>The review committee should clarify all the unclear points by inquiring or sending letters to the DIDT and if necessary visit the site together with the members of DIDT for clarification.</p>
<p>Sub-step 4 Prepare the review papers on screening.</p>	<p>The review committee should prepare review papers containing the results of the assessment of screening and the outcomes from the process of clarification mentioned in Sub-step-3.</p>
<p>Sub-step 5 Issue an official letter on assessment and endorsement.</p>	<p>The Zonal Irrigation Engineer, on behalf of the review committee, will submit an official letter on assessment and endorsement to <b>the District Executive Director (DED)</b>. The official letter should accompany the review papers.</p>
<p>Sub-step 6 Compile the documents and obtain useful information for the field survey.</p>	<p>All the documents including the survey sheet of each scheme, screening report, review paper and official letter should finally be compiled. At the same time, the review committee should assist DIDT in obtaining the following maps to be used in the field survey.</p> <ul style="list-style-type: none"> <li>Agro-ecological zone and the distribution of surveyed schemes</li> <li>Land cover and the distribution of surveyed schemes</li> <li>Land unit and the distribution of surveyed schemes</li> <li>Protected area and the distribution of surveyed schemes</li> <li>Rainfall distribution and the distribution of surveyed schemes</li> <li>Soil type and the distribution of surveyed schemes</li> <li>1:50,000 scale topographical maps around the selected schemes</li> </ul>

## Step-5: Field Survey for Selected Irrigation Schemes

### (a) Preparatory Works in the Office prior to the Field Survey

#### Key Message

Clarify the role of each member of DIDT for the execution of the field survey and familiarize with the natural condition of the site through available data before starting the field survey

#### Why is the work required?

Good preparation enables the DIDT to undertake field survey smoothly.

#### Key for the success of the work

Understand the flow of the field survey and clarify the role of each member through the scrutiny of the guidelines. Analyze the materials supplied from the data and information management unit and familiarize with the natural condition of the site before visiting.

#### Required inputs

1. District Irrigation Development Team (DIDT)

#### How is the work carried out?

Sub-step 1 Hold a meeting by the DIDT members	The guidelines should be examined carefully by the DIDT members and then the role of each member should be clarified in order to execute the field survey efficiently. The team leader and personnel responsible for interview survey, mapping, and field study should at least be decided. Prepare the detailed field survey schedule.
Sub-step 2 Inform survey schedule to village(s)	Inform relevant village(s) about the field survey schedule and ask them to invite stakeholders, such as village leaders, ward secretary, irrigators' organization (IO) chairpersons, village extension officer and some villagers. If a negative impact, such as water conflict, is anticipated, then representatives of the parties that may be affected should also be invited.
Sub-step 3 Become familiar with the natural conditions of the site through the materials available	The team familiarizes itself with the natural conditions of the site in respect of: 1) Agro-ecological zone (recommended farming system) 2) Land cover (present land use) 3) Land units (topographical constraints) 4) Protected area (distribution of protected areas) 5) Rainfall distribution (annual rainfall range) 6) Soil types (general soil characteristics) 7) 1:50,000 scale topographical maps (topographic feature)
Sub-step 4 Prepare photocopies of the survey sheets and large paper sheets and markers for mapping	It is recommended to prepare photocopies of the survey sheets for efficient recording of the survey results ( <b>Form-3</b> and <b>Form-4</b> ). For <b>Form-4 (5/7)</b> and <b>Form-4 (6/7)</b> , one form should be used for one river or lake/pond, so several photocopies may be required. Large (A1 size) paper sheets and markers should also be prepared for the village resource mapping.

#### **Filling Survey Sheets on Site**

Prepare photocopies of the survey sheets and fill the information on site so that you do not miss any important data

## (b) Interview Survey with Stakeholders

<p><b><u>Key Message</u></b> Collection of data and information on the present condition the scheme including agriculture, of farmers' organization, environment and existing irrigation</p>	
<p><b><u>Why is the work required?</u></b> To be appropriate, an irrigation scheme plan should be formulated based on the present local conditions. The present conditions relating to agriculture, institutions, environment and existing irrigation and drainage system should therefore be assessed properly.</p>	
<p><b><u>Key for the success of the work</u></b> Interview survey will be carried out with stakeholders by using a suitable checklist for effective information collection. This process will be reinforced with readily available information. Furthermore, the results of the interview survey will be crosschecked through subsequent site inspection.</p>	
<p><b><u>Required inputs</u></b></p> <ol style="list-style-type: none"> <li>1. District Irrigation Development Team (DIDT)</li> <li>2. Previous related reports on irrigation and drainage</li> <li>3. Survey sheets for interview survey (<b>Form-3</b>)</li> <li>4. Environmental site hand book</li> </ol>	
<p><b><u>How is the work carried out?</u></b></p>	
<p>Sub-step 1 Explain the purpose of the field survey to the participants</p>	<p>At the beginning of the session, the purpose of the field should be explained clearly to the participants along with the General flow of the activities. Background information such as the Reason why this scheme was selected should be explained. Special attention should be paid to ensure that villagers do not develop excessive expectations on the future of the project, and that, in case we proceed to implementation, farmers' contribution, 20% of construction costs, is necessary in the scheme development</p>
<p>Sub-step 2 Prepare the group for interview survey and mapping</p>	<p>The participants will be divided into two groups for interview Survey and mapping. Ask the village chairperson to choose suitable personnel who know the area very well as the Mapping group members. (Excessive time will be consumed if the mapping is conducted with too many people.) The interview group will consist of farmers of different gender and generation and the group should include at least the village Chairperson and the chairperson of the organization. The Village extension officer should attend and supervise both groups.</p> <p><b>For mapping group: Go to next page</b></p>
<p>Sub-step 3 Conduct the interview survey using a suitable checklist</p>	<p>The interview survey will be conducted using <b>Form-3</b> for the following aspects:</p> <ol style="list-style-type: none"> <li>(a) Present conditions of Agriculture and Marketing,</li> <li>(b) Present conditions of Irrigators' Organization, and</li> <li>(c) Present conditions of Environment.</li> </ol>
<p>Sub-step 4 Compile and analyze the survey results</p>	<p>DIDT will compile and analyze the results of the interview survey in the next step and fill form 15.</p>

**Note: Indicative time required for the interview survey is 1.5 hours/scheme.**



## (d) Making Agreement on Proposed Area

### Key Message

Proposed area for further planning should be determined and agreed by stakeholders

### Why is the work required?

To avoid conflict among villagers living inside and outside of the proposed area, it is essential that the proposed area be determined by villagers themselves.

### Key for the success of the work

- 1) It should be emphasized that the proposed area is delineated not for development but for study.
- 2) Budget limitation of the district government should be clearly announced to the stakeholders.
- 3) Technical limitations in areas such as water resources, land, etc. should be clearly explained to the stakeholders.

### Required inputs

1. District Irrigation Development Team (DIDT)
2. Village resource map

### How is the work carried out?

Sub-step 1 Reconfirm that relevant stakeholders attend the meeting	Reconfirm that all relevant stakeholders (representatives of related villages, such as village leaders) attend the meeting. If not, the meeting should be postponed.								
Sub-step 2 Receive explanation of village resource map by the mapping group	The mapping group leader should present the village resource map to the interview group members and finalize it according to the suggestions from the participants. Especially for the potential area, let the stakeholders confirm the boundary.								
Sub-step 3 Grasp possible size of the proposed area	DIDT should grasp the possible size of the potential area considering allowable budget for irrigation development in the governing <b>ISD</b> . The following table shows the indicative cost of schemes development by size of area. If the size of the potential area seems more or less suitable for a <b>ISD</b> , proceed to Sub-step 6. If not (the potential area is too large), proceed to Sub-step 4.								
	<b>Indicative Cost of Scheme development</b>								
	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Size of area (ha)</th> <th>Indicative Development Cost (Tsh.)</th> </tr> </thead> <tbody> <tr> <td>50</td> <td>150,000,000 - 300,000,000</td> </tr> <tr> <td>100</td> <td>250,000,000 - 500,000,000</td> </tr> <tr> <td>150</td> <td>350,000,000 - 700,000,000</td> </tr> </tbody> </table>	Size of area (ha)	Indicative Development Cost (Tsh.)	50	150,000,000 - 300,000,000	100	250,000,000 - 500,000,000	150	350,000,000 - 700,000,000
Size of area (ha)	Indicative Development Cost (Tsh.)								
50	150,000,000 - 300,000,000								
100	250,000,000 - 500,000,000								
150	350,000,000 - 700,000,000								
Sub-step 4 Explain budgetary limitation and technical limitation	Explain to the stakeholders that the objective of this survey is promote irrigation development under the <b>ISD</b> , and the available budget is limited. Make them understood that it is difficult to develop the whole potential area at once because of budgetary limitation. Technical limitation should also be explained to stakeholders. Make them understood that it is impossible to irrigate their field if there are not enough water								
Sub-step 5 Let farmers choose the first priority proposed area in the village resource map	After explanation, let the stakeholders choose the first priority proposed area, which is the area for the survey. If they cannot conclude their own idea, it means that the scheme might not be ready for development.								
Sub-step 6 Prepare confirmation letter on the proposed area	Ask stakeholders to prepare a "confirmation letter on the proposed area" showing that they have agreed on the boundary of the proposed area indicated in the village resource map. A list of attendants with necessary notes should be attached to prove the conclusion of the meeting. and attachment of the minutes of the village general assembly								

**Note: Express gratitude to the participants and release them except for the personnel who will go together with the DIDT to the field.**

## (e) Confirmation of the Field Conditions

### Key Message

Water and land potential of the proposed area should be confirmed by simple method

### Why is the work required?

Water and land resources are one of the most important factors for successful irrigation scheme development, so their conditions need to be confirmed at the site. For rehabilitation or improvement schemes, condition of the existing irrigation and drainage facilities are also very important factors, so they also should be checked at the site.

### Key for the success of the work

Visit the site with the guidance of the village chairperson and several villagers to interview about the situation of the proposed area.

### Required inputs

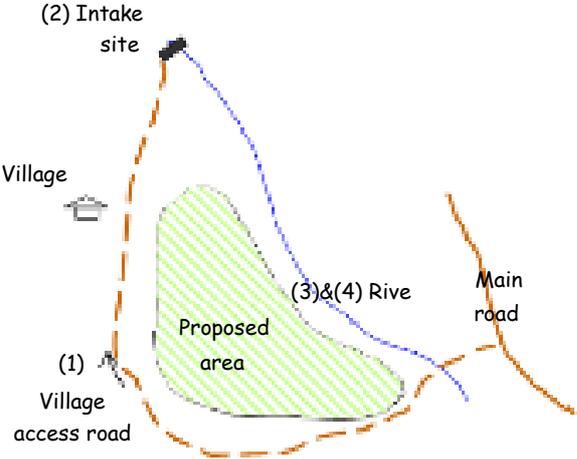
1. District Irrigation Development Team (DIDT)
2. Survey sheets for field conditions confirmation (**Form-4**)

### How is the work carried out?

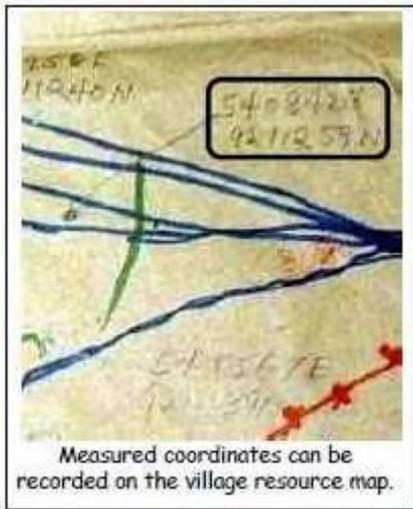
Sub-step 1 Confirm soil texture of the proposed area	Visit the proposed area together with village chairperson and check and record the soil texture using <b>Form-4 (1/7)</b> .
Sub-step 2 Confirm field drainage condition	Ask farmers in the proposed area about drainage condition in a normal year using <b>Form-4 (2/7)</b> .
Sub-step 3 Confirm bridge and river crossing condition	Visit bridge and river crossing sites and confirm the conditions using <b>Form-4 (3/7)</b> .
Sub-step 4 Confirm intake point condition	Determine and visit intake point and confirm the condition using <b>Form-4 (4/7)</b> .
Sub-step 5 Confirm water source river condition of the scheme	(This sub-step is applicable if the water source for the scheme is a river or there is an inflow to a lake/pond water source.) Visit the water source river together with village chairperson and check the water resource using <b>Form-4 (5/7)</b> .
Sub-step 6 Confirm water source lake/pond condition of the scheme	(This sub-step is applicable if water source for the scheme is lake/pond and water abstraction method is pump. If water abstraction method is treadle pump, the sub-step should be skipped.) Visit the water source lake/pond together with village chairperson and check the water resource by using <b>Form-4 (6/7)</b> .
Sub-step 7 Confirm condition of existing irrigation facilities	(This sub-step is applicable if there are irrigation and drainage facilities.) Observe and evaluate the condition of facilities together with irrigators' organization chairperson and members using <b>Form-4 (7/7)</b> .

**Note:** Indicative time required for the field condition confirmation is 2-3 hours/scheme.

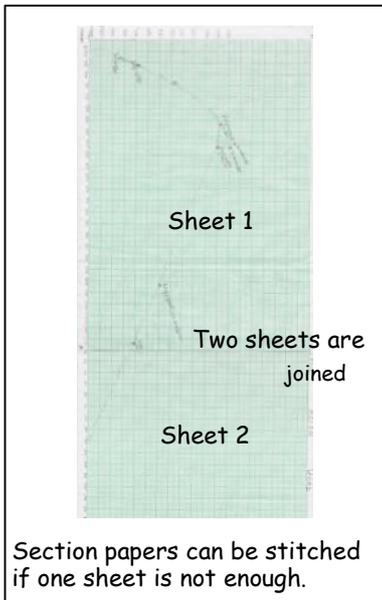
**(f) Preparation of Present Situation Map**

<p><b>Key Message</b> Utilize handheld GPS and record coordinates of the features recorded in the village resource map to prepare the scaled map of the scheme</p>	
<p><b>Why is the work required?</b> Preparation of a scaled topographical map is essential for scheme development planning.</p>	
<p><b>Key for the success of the work</b> Visit the site and measure coordinates of the major points by handheld GPS. UTM system should be used as the coordinate system and GIS application can be adopted as alternative method.</p>	
<p><b>Required input</b></p> <ol style="list-style-type: none"> <li>1. District Irrigation Development Team (DIDT)</li> <li>2. Village resource map</li> <li>3. Villager (guide for the survey area)</li> <li>4. Handheld GPS, sheets of section (graph) paper (A3 or A4 size), pencils</li> <li>5. Computer with access of internet /Google Earth pro.</li> </ol>	
<p><b>How is the work carried out?</b></p>	
<p>Sub-step 1 Decide the route to be taken on site</p>	<p>Review the village resource map and determine the route to be taken on site. The following is a general route.</p> <ol style="list-style-type: none"> <li>1) Take the access road from the downstream portion.</li> <li>2) Go up to the intake site. 3&amp;4) Record the boundary of the proposed area and existing irrigation facilities (if any) and the river along the area.</li> </ol> <p>*Order should be decided considering field conditions.</p> 
<p>Sub-step 2 Set GPS in UTM system</p>	<p>Before going to the site, the coordinate system of GPS should be confirmed. UTM should be employed for map preparation. In general, the default system is Lat/Lon, so it should be switched to UTM before the survey</p> <p>e.g. n Lat/Lon: UTM: 5°57.628'S 345163E 37°46.374'E 9324327N (unit: degree/minutes) (unit: m)</p>

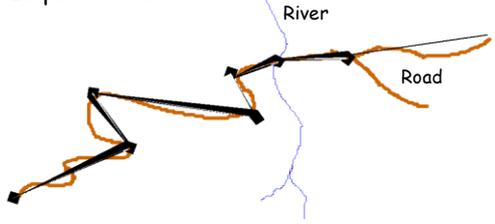
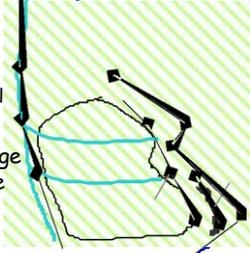
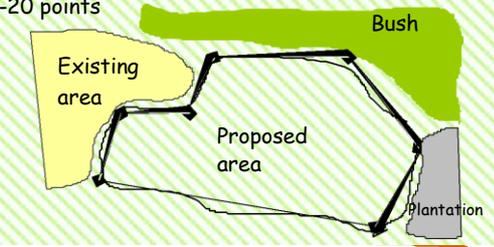
Sub-step 3 Visit the site with a villager and record the coordinates and observations



Measured coordinates can be recorded on the village resource map.



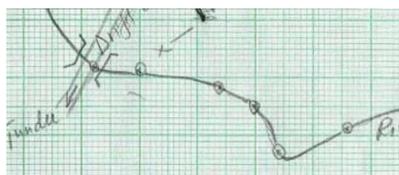
Visit the site and ask a villager to accompany the survey team. A villager who attended village resource mapping would be appropriate. Follow the route under the guidance of him/her and record the coordinates of the route. Items and approximate number of points are shown below.

Items	Measuring point
Road	<ul style="list-style-type: none"> <li>-junction</li> <li>-major turning point</li> <li>-river crossing point (including bridge)</li> </ul> *5-15 points in all. 
River /Irrigation Facilities	<ul style="list-style-type: none"> <li>River</li> <li>-major turning points</li> <li>along the proposed area</li> <li>Irrigation facilities</li> <li>-intake site Main (proposed/existing) canal</li> <li>-any canal diversion</li> <li>-any junction of Dike drainage</li> <li>-any route of flood dike</li> </ul> *5-10 points for each items (intake site:1) 
Proposed area	<ul style="list-style-type: none"> <li>-corner of the boundary</li> </ul> *10-20 points 

Sub-step 4 Estimate the area to be cropped within the proposed area

Roughly estimate the cropped area within the proposed area by percentage for the crops grown in rainy and dry season based on the opinion of villagers accompanied.

Sub-step 5 Plot the coordinates on section paper and write down surrounding items.



Sample of a present situation map

- 1) Pick the coordinates including the maximum/minimum value in each axis.
- 2) Set the grid in order that it may cover the max/min value. 1:10,000 (1cm=100m) is easily applied for schemes of around 50 ha. If one sheet is not enough, add some more sheets and combine them.
- 3) Plot the coordinates and connect them. Write down related information such as village, forest reserve, percentage of cropped area in the proposed area etc.

Note: Indicative time required for preparation of present situation map is 2-3 days/scheme. (1-2 days for site visit and a half day for plotting.)

## Step-6: Preliminary Planning for Selected Irrigation Schemes

### (a) Irrigation Water Requirement Estimation

#### Key Message

Estimate irrigation water requirement reflecting site conditions analyzed through field survey

#### Why is the work required?

Irrigation water requirement is the total water demand for crop cultivation in the irrigation scheme, and is a key factor for determination of the development area.

#### Key for the success of the work

Irrigation water requirement is estimated reflecting site conditions analyzed in the field survey. Meteorological conditions, soil conditions and situation of present crop production are the key factors.

#### Required inputs

1. District Irrigation Development Team
2. Calculation sheet for irrigation water requirement (**Form-5**)
3. Calculator

#### How is the work carried out?

Sub-step 1 Obtain net water requirement

Estimate gross unit water requirement by using **Form-5**.

Note  
:  
Befo  
re

starting the planning, refer to Attachment-3 (Additional Explanation on Economic Analysis of the Scheme).

## (b) Water Balance Study

### Key Message

Appropriate water balance through analysis on available water resource and water demand by crop cultivation

### Why is the work required?

To effectively utilize water for irrigation, in irrigation planning it is important to quantify and set the appropriate balance between available water and water required for irrigation.

### Key for the success of the work

The water balance study is a time-consuming activity because many factors are studied and analyzed. The water balance study shall therefore be conducted taking into account the required accuracy for planning. At this stage, only preliminary planning is required for ISD

### Required inputs

1. District Irrigation Development Team (DIDT)
2. Calculation sheet for water balance study (**Form-6**)
3. Calculator

### How is the work carried out?

Sub-step 1 Conduct water balance calculation for river	<u>This sub-step is applicable for the river water source scheme</u> Conduct water balance using <b>Form-6(a)</b> .
Sub-step 2 Conduct water balance calculation for lake/pond	<u>This sub-step is applicable for the lake/pond water source scheme</u> Conduct water balance using <b>Form-6(b)</b> .

### Box

#### Water and Land

Availability of water and land is the most crucial factor for irrigation development. Irrigation development shall be concurrently approached for both water and land resources, not one side only. This approach seeks for a good balance between available water and water demand for crop cultivation on the available land, which in turn leads to an appropriate development scale.

### Box

#### Irrigable Area in Dry Season

If the irrigable area in the dry season is smaller than the development area, it means that the irrigation system cannot supply enough water for the whole development area in the dry season. However, this does not mean that the system always supplies water only to the upstream farm plots in the dry season. Water distribution in the dry season should be discussed and agreed by the irrigators' organization. Area-wise rotation of irrigable farm plots on an annual basis is recommended.

### (c) Scheme Development Planning and Development Cost Estimate

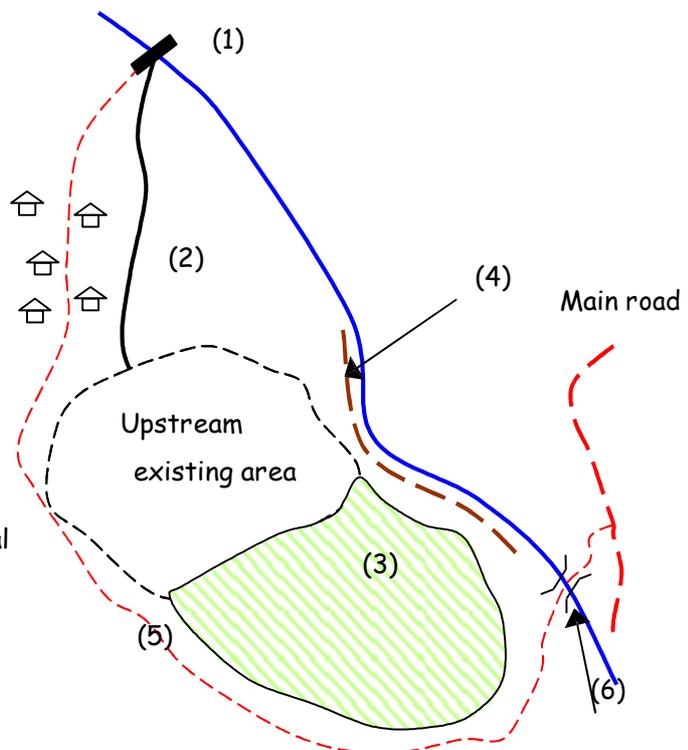
<b>KeyMessage</b>	
Planning of irrigation system well-fitted to site conditions, aiming at timely water supply of proper quantity	
<b>Why is the work required?</b>	
To present a development framework incorporating all the major features of the irrigation scheme with a cost estimate.	
<b>Key for the success of the work</b>	
It is important to grasp the site conditions, such as topographic conditions, farmers' intentions, and any existing irrigation facilities, and reflect them in the system plan. In preparing <b>ISD</b> , the components of the scheme development plan shall be as shown in <b>Figure-3</b> .	
<b>Required inputs</b>	
1. District Irrigation Development Team (DIDT)	
<b>How is the work carried out?</b>	
Sub-step 1 Prepare scheme development plan and estimate development cost	Conduct preliminary design and cost estimate by using <b>Form-7</b> . Concerning unit costs for construction materials and unit work, DIDT shall consult with district engineers to get updated district unit rates every year.
Sub-step 2 Finalize scheme development plan map	Confirm that all the required information is plotted on the scheme development plan map as explained in <b>Figure-3</b> .

**Figure-3 Sample of Scheme Development Plan Map**

The scheme development plan map shall be prepared by plotting the following information on the present situation map.

- (1) weir/intake (or pump)
- (2) main canal /associated Structures
- (3) proposed area (not necessary to be development area)
- (4) flood dike
- (5) village access road
- (6) village bridge/river crossing

The example at right shows a typical expansion scheme (upstream area has already been developed and downstream area is proposed to be developed).



## (d) Estimate of Scheme Incremental Benefits

### Key Message

Estimate of costs covering construction, O & M, replacement of equipment, administration, engineering services and supporting work, and of benefits from increased crop production less production cost

### Why is the work required?

To estimate and clarify the required costs for scheme development and the expected benefits to accrue from scheme development. This is important for budgeting and future project evaluation.

### Key for the success of the work

Costs and benefits for scheme formulation should be estimated considering the required accuracy for the particular planning stage to avoid spending unnecessary time and labour costs. In this case, the required level is preliminary, so a rough estimate is good enough, although the necessary costs and benefits need to be covered.

### Required inputs

1. District Irrigation Development Team (DIDT)
2. Scheme Incremental Benefit Estimation Sheet (**Form-8**)

### How is the work carried out?

Sub-step 1 Estimate scheme incremental benefit	Estimate scheme incremental benefit by using <b>Form-8</b> .
--	--

## (e) Institutional Development Plan

### Key Message

Activation of Irrigators' Organization (IO) for existing schemes and promotion of establishment of IO for new projects aiming at operation and maintenance of irrigation schemes

### Why is the work required?

IOs are principal actors in irrigation scheme formulation. Therefore it is indispensable to establish and activate IO. At this stage, it is necessary to clarify the direction for activation, establishment and registration of the IO.

### Key for the success of the work

The future direction should be determined according to the survey results on the present situation and farmers' intentions for establishment and registration of the IO obtained through the interview survey (refer to **Form-3 (2/3)**).

### Required inputs

1. District Irrigation Development Team (DIDT)
2. Data and information obtained through field survey
3. Planning sheet for institutional development plan (**Form-9**)

### How is the work carried out?

Sub-step 1 Determine the future direction of Irrigators' Organization	Determine the future direction of Irrigators' Organization with respect to activation, establishment and registration by using <b>Form-9</b> .
---	--

For a new development scheme, irrigators' organizations shall be formed only after the development is facility budgeted by ISD. Establishing it before budgetary viability is confirmed may make farmers disappointed.

Since the cost of institutional development was already estimated in Step-6 (c) as "Soft Component Cost", it is not necessary to estimate the cost in Step-6 (e)

## (f) Review of the Development Plan and Economic Evaluation

<p><b><u>Key Message</u></b> Analyze economic viability of the scheme</p>	
<p><b><u>Why is the work required?</u></b> It is essential to know whether the scheme is worth investing for the district or not.</p>	
<p><b><u>Key for the success of the work</u></b> Obtain and apply reasonable data and information estimating the scheme benefits.</p>	
<p><b><u>Required inputs</u></b> 1. District Irrigation Development Team (DIDT) 2. Check list of the development plan (<b>Form-11</b>)</p>	
<p><b><u>How is the work carried out?</u></b></p>	
Sub-step 1 Obtain Economic Internal Rate of Return (EIRR)	Obtain EIRR of the scheme by using <b>Table-7</b> .
Sub-step 2 Review the Development Plan	Review the irrigation technical plan and agricultural information by using the check list ( <b>Form-10</b> ). If the answer is NO, the information should be confirmed by visiting the site or by some other method. Especially if the obtained EIRR in Sub-step 1 is out of the range, the agricultural data should be carefully checked again. If necessary, the development plan should be revised according to the confirmed data.
Sub-step 3 Analyze necessity for a study of alternatives	After reviewing the development plan, obtain the EIRR by using <b>Table-7</b> . If the obtained EIRR is less than 10%, it is necessary to seek the possibility of increasing the EIRR by changing some part of the plan (alternative study is needed).
Sub-step 4 Conduct alternative study	Conduct alternative study if it is judged to be necessary in Sub-step 3.

**Table-7 Simplified Chart for EIRR Estimation (with 30 years project life)**

EIRR (%)		Annual Incremental Agricultural Benefit (million Tsh.)												
		2.5	5.0	7.5	10	15	20	30	40	50	75	100	125	150
Total Scheme development Cost (million Tsh.)	50	2.5	8.9	14.0	18.7	27.2	35.2	L	L	L	L	L	L	L
	75	S	4.9	8.9	12.4	18.7	24.5	35.2	L	L	L	L	L	L
	100	S	2.5	5.9	8.9	14.0	18.7	27.2	35.2	L	L	L	L	L
	125	S	0.8	4.0	6.6	11.0	15.0	22.2	28.9	35.2	L	L	L	L
	150	S	S	2.5	4.9	8.9	12.4	18.7	24.5	29.9	L	L	L	L
	175	S	S	1.3	3.5	7.3	10.4	16.1	21.2	26.1	37.3	L	L	L
	200	S	S	0.3	2.5	5.9	8.9	14.0	18.7	23.1	33.2	L	L	L
	225	S	S	S	1.6	4.9	7.6	12.4	16.7	20.7	29.9	38.5	L	L
	250	S	S	S	0.8	4.0	6.6	11.0	15.0	18.7	27.2	35.2	L	L
	275	S	S	S	0.1	3.2	5.7	9.9	13.6	17.0	25.0	32.3	39.3	L
	300	S	S	S	S	2.5	4.9	8.9	12.4	15.6	23.1	29.9	36.4	L
	350	S	S	S	S	1.3	3.5	7.3	10.4	13.4	20.0	26.1	31.8	37.3
	400	S	S	S	S	0.3	2.5	5.9	8.9	11.6	17.6	23.1	28.3	33.2
	450	S	S	S	S	S	1.6	4.9	7.6	10.1	15.6	20.7	25.4	29.9
	500	S	S	S	S	S	0.8	4.0	6.6	8.9	14.0	18.7	23.1	27.2
	600	S	S	S	S	S	S	2.5	4.9	7.0	11.6	15.6	19.4	23.1
	700	S	S	S	S	S	S	1.3	3.5	5.5	9.7	13.4	16.7	20.0

Note S: smaller than 0%, L: larger than 40%

Indicated EIRR values in the table are obtained through calculation under the condition having two years construction period with evenly distributed cost and expecting the specified benefit annually.

## (g) Prioritization of the Selected Schemes

### Key Message

Prioritize selected schemes from multi-viewpoints of adequacy, efficiency, dependability and equity

<u>Why is the work required?</u>	
Prioritization of selected schemes is essential to implement irrigation development within limited budget.	
<u>Key for the success of the work</u>	
Successful prioritization employs logical evaluation of the schemes using transparent processes.	
<u>Required inputs</u>	
<ol style="list-style-type: none"> <li>1. District Irrigation Development Team (DIDT)</li> <li>2. Scheme prioritization sheet (<b>Form-11</b>)</li> <li>3. Scheme digest (<b>Form-12</b>)</li> </ol>	
<u>How is the work carried out?</u>	
Sub-step 1 Evaluate adequacy	<p>Evaluate the adequacy and rank the schemes. Adequacy of the schemes can be evaluated by the following factors as a minimum.</p> <ol style="list-style-type: none"> <li>a) Technical adequacy               <ol style="list-style-type: none"> <li>i) Reliability of intake water level (see <b>Form-10</b>), ii) availability of construction material, iii) availability of construction company</li> </ol> </li> <li>b) Social adequacy               <ol style="list-style-type: none"> <li>i) villagers consensus, ii) farmers motivation</li> </ol> </li> </ol> <p>Ranking result shall be entered in <b>Form-11</b>. If adequacy of the</p>
Sub-step 2 Evaluate efficiency	<p>Evaluate efficiency and rank the schemes. Efficiency of the schemes can be evaluated by the following factors as a minimum.</p> <ol style="list-style-type: none"> <li>a) EIRR (Economic Internal Rate of Return)</li> </ol> <p>Ranking result shall be entered in <b>Form-11</b>. If EIRR is less than 5%, enter "NG" in the <b>Form-11</b>.</p>
Sub-step 3 Evaluate dependability	<p>Evaluate dependability and rank the schemes. Dependability of the schemes can be evaluated by the following factors as a minimum.</p> <ol style="list-style-type: none"> <li>a) Performance of existing institutions (see <b>Form-3</b>)</li> <li>b) Performance of farmers in group activities (see <b>Form-3</b>)</li> </ol> <p>Ranking result shall be entered in <b>Form-11</b>. If the dependability of the scheme is not good enough for implementation, enter "NG" in the <b>Form-11</b>.</p>
Sub-step 4 Evaluate equity	<p>Evaluate equity and rank the schemes. Equity of the schemes can be evaluated by the following factors as a minimum.</p> <ol style="list-style-type: none"> <li>a) Even distribution of land in the development area</li> <li>b) No water conflicts between adjacent villages (over water rights)</li> </ol> <p>The ranking shall be entered in <b>Form-11</b>. If equity of the scheme is</p>
Sub-step 5 Prioritize the schemes	<p>Prioritize the schemes by using the analysis results of <b>Form-11</b>. However, <b>Form-11</b> is only one of the tools for prioritization, so the final decision should be made considering District priority for irrigation development, scheme readiness for implementation, etc. If none of the schemes seem to be mature, proceed to <b>Step-7</b>.</p>
Sub-step 6 Prepare scheme digest	<p>Prepare a scheme digest of the first priority scheme for <b>ISD</b> by using <b>Form-12</b>.</p>

## Step-7: Identification of District Supporting Programme

### Key Message

Identification of the District supporting programme required for the smooth implementation of the irrigation scheme

### Why is the work required?

In addition to the irrigation scheme formulation described in the previous steps, the district supporting programme might be needed in some cases for effective implementation of the irrigation scheme.

### Key for the success of the work

The district supporting programs should be identified through review and analysis of the quick site inspection, screening, field survey, and preliminary planning.

### Required inputs

1. District Irrigation Development Team (DIDT)
2. Report on screening work for irrigation schemes along with the result of the quick site inspection
3. Field survey results for irrigation schemes selected
4. Preliminary plan for selected irrigation schemes

### How is the work carried out?

Sub-step 1 Arrange the meeting for identification	The participants to the meeting are the members of DIDT, Head of department dealing with irrigation, Ward Extension Officer (concerned), Village Extension Officer (concerned). The following analysis should be carried out in the meeting according to the procedure shown in <b>Figure-4</b> .
Sub-step 2 Review and analysis of the report on screening work for irrigation schemes	Prepare the matrix of all irrigation schemes and the constraints for the smooth implementation of each scheme based on the results of the quick site inspection. Identify the common constraints that are obstructing the smooth implementation of the scheme development. Build up the effective countermeasures as District supporting programs by taking the District priority on irrigation development into account.
Sub-step 3 Review and analysis of the field survey results and preliminary plan for irrigation schemes selected	A similar detailed analysis should be carried out for the selected irrigation schemes based on the field survey results and preliminary plans prepared. Identify common and particular constraints and build up the effective countermeasures. If such countermeasures are judged important according to the District priority on irrigation development, consider those as additional District supporting programs.
Sub-step 4 Identification of the District supporting program	The District supporting programs suitable for inclusion in <b>ISD</b> will be decided by analyzing all the above mentioned programs. This process should be carried out by focusing on the activities required for the smooth implementation of the irrigation scheme.

### **Box**

#### **Meaning of District Supporting Programme**

The district supporting programmes are considered to be programmes that contribute to solve the common problems in the irrigation sub-sector of a district or to assist non-mature irrigation schemes in reaching consensus etc. Other programmes may be adopted to strengthen the management of scheme implementation, to enhance the benefits of irrigation, and to sustain the implemented irrigation. Only improvement plans for problems of the irrigation sub-

**Figure-4 Flow of District Supporting Programme Identification**

**Sub-step 2 Review and Analysis of Quick Site Inspection Results**

**Findings through Quick Site Inspection**

Constraints	Scheme-1	Scheme-2	Scheme-3	-----	Scheme-n
Insufficient capacity of DIDT to execute irrigation projects	○	○	○		○
Insufficient Participation of Farmers in Irrigation Development Programme	○		○		
Insufficient Skill of Farmers in Scheme Management and O&M of Irrigation Facilities					○
-----					
-----					



Extraction of Necessary Countermeasures

**Sub-step 3 Review and Analysis of Field Survey Results**

Constraints	Scheme-1	Scheme-2			
Insufficient experience of both DIDT and farmers in irrigation	○	○			
Insufficient Function of Irrigators' Organization		○			
Insufficient Experience of Farmers in Rice Production		○			
-----					
-----					



Extraction of Necessary Countermeasures

**Sub-step 4 Identification of the District Supporting Programme**

Conceivable Countermeasures

- District Staff Capacity Building Programme
- Farmers' Participation in Irrigation Development Programme
- Farmers' Participation in Training Programme
- Village Irrigation Development Guideline Establishment Programme
- Farmers' O&M Manual Establishment Programme
- District Staff and Farmers' Study Tour Programme
- Irrigators' Group Establishment Programme (for existing schemes)
- Irrigated Agriculture Training Programme for Rice Production Increase



Identification of the Effective Countermeasures



Identification of the Candidate District Supporting Programme

For new development schemes, an irrigators' group shall be formed only after the scheme development is budgeted in **ISD**. Establishment without available budget may lead to farmers being disappointed.

## Step-8: Design of District Supporting Programme

### Key Message

Design the District supporting programme by using matrix format

<u>Why is the work required?</u>	
To shape the required actions for the identified District supporting programme.	
<u>Key for the success of the work</u>	
Logical thinking is the key to the success of the work. All the activities shall be related to the goal of the plan, and the inputs shall be required to conduct the activities.	
<u>Required inputs</u>	
<ol style="list-style-type: none"> <li>1. District Irrigation Development Team (DIDT)</li> <li>2. District supporting programme digest (<b>Form-13</b>)</li> </ol>	
<u>How is the work carried out?</u>	
Sub-step 1 Identification of target group	<p>Identify target group (the group which will be improved by the District supporting programme) of the District supporting programme. Fill the column "Target Group" of <b>Form-13</b> to answer the following question.</p> <ol style="list-style-type: none"> <li>1) Who should be improved?</li> </ol>
Sub-step 2 Setting the goal	<p>Set the only one goal of the District supporting programme (goal of the activities). Fill the column "Goal" of <b>Form-13</b> to answer the following question.</p> <ol style="list-style-type: none"> <li>1) What should be achieved?; and</li> <li>2) By when the target should be achieved?</li> </ol>
Sub-step 3 Required activities to achieve the goal	<p>Determine the activities required to achieve the goal. The activities shall be detailed actions to be taken. Fill the column "Activities" of <b>Form-13</b> to answer the following questions.</p> <ol style="list-style-type: none"> <li>1) Required activities to achieve goal.</li> <li>2) Who will take action?; and</li> <li>3) Tentative time schedule.</li> </ol>
Sub-step 4 Required inputs to conduct activities	<p>Identify the required inputs to conduct the activities. Fill the column "Input" of <b>Form-13</b> to answer the following question.</p> <ol style="list-style-type: none"> <li>1) What is required to conduct the activity? and</li> <li>2) What is the quantity of the input required?</li> </ol>
Sub-step 5 Give a suitable title of the programme	<p>Give a suitable title to the District supporting programme and enter it in <b>Form-13</b>. For Monitoring steps 6-8 DIDT should fill Form -15 and submit to ZIO.</p>

## Step-9: Preparation of Irrigation Scheme Formulation Plan Report

### Key Message

Compilation of all results of field survey, preliminary planning, prioritization and District supporting programme

### Why is the work required?

The DIDT shall submit a report to ZIO/RIO containing all the results of the field survey, preliminary

### Key for the success of the work

To compile such a wide range of information, the various forms filled for each scheme in the course of the irrigation scheme formulation shall be utilized efficiently.

### Required inputs

1. District Irrigation Development Team (DIDT)
2. All the forms filled for each scheme in the course of irrigation scheme formulation
3. Maps created in the course of irrigation scheme formulation
4. Form to summarize irrigation scheme formulation plan (**Form-14**)

### How is the work carried out?

<p>Sub-step 1 Decide contents of the irrigation scheme formulation plan for <b>ISD</b> this year</p>	<p>Decide what kinds of activities are most important for irrigation Development in the district for <b>ISD</b> according to the year being planned. Basically, development of the first priority scheme or a combination of the first priority scheme and a District supporting programme are recommendable. However, if the first priority scheme is not well matured (insufficient consensus or motivation), the district supporting programme should be proposed for this year and scheme development can be postponed.</p>
<p>Sub-step 2 Summarize the irrigation scheme formulation plan</p>	<p>Finalize the plan by using <b>Form-14</b>.</p> <ol style="list-style-type: none"> <li>1) Allocate the cost of operation and maintenance and for the schemes in operation (farmers contribution can be considered)</li> <li>2) Allocate the cost of irrigation scheme formulation for <b>ISD</b> period.</li> <li>3) Estimate the cost required for scheme development, if there is a recommendable scheme.</li> <li>4) Estimate the cost of the district supporting programme, if</li> </ol>
<p>Sub-step 3 Prepare the report on the irrigation scheme formulation plan for <b>ISD</b></p>	<p>Prepare the irrigation scheme formulation plan report to explain DIDT reached its conclusions. All the completed forms (<b>Form-3 Form-14</b>) and the scheme development plan map shall be the report. In case all the selected schemes are judged unsuitable or not mature for implementation and there is no candidate scheme at this stage, the reason shall be mentioned in Format of the irrigation scheme formulation plan report is attached in Supplementary Explanation.</p>
<p>Sub-step 4 Submit the report to ZIO/RIO</p>	<p>DIDT will submit the report to ZIO/RIO for validation and When the district apply for Fund, there is conditionality. Refer to criteria for requesting fund.agreement.</p>

## Step-10: Validation and Agreement by ZIO/RIO

### Key Message

Validation and agreement with objectivity and transparency

<u>Why is the work required?</u>	
The irrigation scheme formulation plan was formulated by the DIDT. This formulation work calls for accountability to all stakeholders since the prepared plan is closely related to the implementation. In this sense, validation and agreement by a third party is essential.	
<u>Key for the success of the work</u>	
The specific review team formed at <b>Step-4</b> shall be engaged in the review on the report submitted by DIDT to maintain the consistency from screening through to District supporting programme.	
<u>Required inputs</u>	
<ol style="list-style-type: none"> <li>1. Zonal Review Committee (ZRC)</li> <li>2. District Irrigation Development Team (DIDT)</li> <li>3. Irrigation scheme formulation Plan Report</li> </ol>	
<u>How is the work carried out?</u>	
Sub-step 1 Review the report of irrigation scheme formulation plan for <b>ISD</b>	The review should focus on the following aspects: <ul style="list-style-type: none"> <li>- Field survey results on each irrigation scheme</li> <li>- Preliminary development plan on each irrigation scheme</li> <li>- Procedure of prioritization</li> <li>- Scheme digest</li> <li>- District supporting programme digest</li> </ul>
Sub-step 2 Prepare and send the questionnaire on the report if finding unclear parts in it	The review committee shall send letters to the DIDT if unclear parts are found, or it shall visit the site together with DIDT.
Sub-step 3 Visit the scheme site	Visit the scheme site together with DIDT and confirm the site conditions.
Sub-step 4 Prepare the review papers on the irrigation scheme formulation plan for <b>DADP</b>	The review committee shall prepare the review papers by compiling the review results.
Sub-step 5 Issue a validation and agreement letter to the DIDT	The Zonal Irrigation Engineer, on behalf of <b>ZIO/RIO</b> , will submit a "Validation and agreement letter" to DIDT. The letter shall be accompanied by the review papers.

## Step-11: Feedback Workshop for Selected Irrigation Schemes

<p><b>Key Message</b> Inform results of irrigation scheme selection to villagers</p>	
<p><b>Why is the work required?</b></p> <p>Since the field survey process was carried out with the full cooperation of the villagers, the study results shall be fed back to the villagers through a workshop.</p>	
<p><b>Key for the success of the work</b></p> <p>Suitable explanation is needed to convince the villagers of the appropriateness of the scheme selected as the first priority candidate for <b>ISD</b> and why other schemes were not selected.</p>	
<p><b>Required inputs</b></p> <ol style="list-style-type: none"> <li>1. District Irrigation Development Team (DIDT)</li> <li>2. Zonal Review Committee (ZRC)</li> <li>3. Irrigation Scheme Formulation Report</li> </ol>	
<p><b>How is the work carried out?</b></p>	
<p><b>(1) For the scheme selected as the candidate of ISD</b></p>	
<p>Sub-step 1 (a) Inform villagers that the scheme was selected as the first candidate for the <b>ISD</b></p> <div data-bbox="209 1272 497 1435" style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Explain to farmers that DIDT prepared the plan using a scientific approach</p> </div>	<p>DIDT should explain the followings.</p> <ol style="list-style-type: none"> <li>1) Possibility of implementation Clearly explain to the villagers that the scheme was only selected as a candidate for the <b>ISD</b>, and the DIDT cannot promise to implement the scheme. Explain that a long process will be followed before implementation, and there is a chance that problems may arise during further study that could postpone implementation. However, the DIDT should explain that they will try their best to promote the scheme development.</li> <li>2) Boundary of the development area Inform the villagers that the boundary of the development area under this study could be adjusted for technical reasons depending on the results of further detailed study.</li> <li>3) Making consensus within the village(s) Explain to farmers that mutual understanding between farmers within and outside the development area is essential to promote the scheme development.</li> <li>4) Irrigable area in the dry season Explain to farmers that the irrigation system might not irrigate all the development area in the dry season due to insufficient water resources, so internal arrangements such as yearly rotation may be needed.</li> <li>5) Necessity of establishing organization In future</li> <li>6) Necessity of obtaining water right under guidance of DIDT and Ministries which Bear a responsibility for it, if not yet obtained</li> </ol>
<p><b>(2) For the scheme not selected as a candidate of ISD on this occasion</b></p>	
<p>Sub-step 1 (b) Explain the study results to villagers so that they understood that the scheme is still in the candidate list for future consideration</p>	<p>The DIDT shall explain the following.</p> <ol style="list-style-type: none"> <li>1) Results of the study The situation should be explained clearly that the scheme was not selected as a candidate for <b>ISD</b> in this year.</li> <li>2) Future enhance of implementation Inform the villagers that there would be future chances for the scheme to be Accepted as a candidate. Furthermore, the major reasons why the scheme was not selected as a candidate shall also be explained clearly referring to the irrigation scheme formulation plan report. If there are any points that can be improved by the villagers, those points shall be informed in order to encourage villagers for their future efforts.</li> </ol>

## Step-12: Finalizing Irrigation Scheme Formulation Plan for ISD

### Key Message

Revise and finalize irrigation scheme formulation plan according to the CMT suggestions

### Why is the work required?

There are various sub-sectors in the agriculture sector. Not all development schemes from the various sub-sectors are inserted in the **ISD** because of limited budget allocated. Therefore, the prepared irrigation scheme formulation plan shall be submitted to the Council Management Team (CMT) as a candidate development plan from the irrigation sub-sector. Phase-wise development should be considered if the budget is not enough for developing all the area at once.

### Key for the success of the work

The prepared irrigation scheme formulation plan shall be presented in precise form to enable the CMT to easily understand the contents.

### Required inputs

1. District Irrigation Development Team (DIDT)
2. Scheme digest and District supporting programme digest
- 3 CMT

### How is the work carried out?

Sub-step 1 Submit prepared plan to CMT	The DIDT shall submit <b>Form-12 to 14</b> attached with verification and agreement to CMT for evaluation.
Sub-step 2 Consider phase-wise development if necessary	If DFT requests the development cost for this year to be reduced, phase-wise development should be considered. After receiving comments from CMT, revise <b>Form-12 to 14</b> . <u>For phasing</u> If severe flood in the development area is anticipated, a flood dike should be constructed prior to the irrigation facilities to prevent the irrigation facilities being washed away by flood.
Sub-step 3 Submit final plan to DFT and ZIO/RIO	Submit revised <b>Form-12 to 15 dully filled</b> to DFT and also to the <b>ZIO/RIO</b> .

### Box

#### Phase-wise Development

In preparation of development plans for irrigation schemes, attention shall be paid to the work volume and time required and the available budget. If the required work volume could not be fulfilled within the budget of a single year, then phase-wise development is an option.

#### Example

- (1) Separate the study/design phase from the implementation phase
- (2) Separate the implementation into several packages considering progressive expansion of the irrigation and drainage canal network.

# **SECTION 3 FORMS**

## Outputs Derived from Activities of Steps

Outputs		
Forms	Reports / Letters / Maps	What the district achieves
<p>Form-1: List of irrigation schemes in the district</p> <p>Form-2: Survey sheet for quick site inspection</p>	<p>Quick site inspection and screening report by DIDT</p> <p>Screening endorsement letter by ZRC</p>	<p>One or more schemes are selected for further preliminary study.</p>
<p>Form-3: Survey sheet for Interview survey</p> <p>Form-4: Survey sheet for Field conditions confirmation</p>	<p>Village resource map</p> <p>Confirmation letter on proposed area by Village</p> <p>Present situation map</p>	<p>Stakeholders and DIDT understand field conditions through field survey.</p>
<p>Form-5: Water requirement calculation</p> <p>Form-6: Water balance study</p> <p>Form-7: Planning sheet</p> <p>Form-8: Benefit estimation</p> <p>Form-9: Institutional development plan</p> <p>Form-10: Check list</p> <p>Form-11: Prioritization of schemes</p> <p>Form-12: Scheme digest</p>	<p>Scheme development plan map</p>	<p>Selected irrigation schemes are preliminarily planned and evaluated, And one or more schemes are selected for further planning.</p>
<p>Form-13: District supporting programme digest</p>		<p>District supporting programmes are designed.</p>
<p>Form-14: Summary of scheme formulation plan</p>	<p>Irrigation scheme formulation plan report by DIDT</p> <p>Validation and agreement letter by ZRC</p>	<p>The schemes selected above are formulated for <b>ISD</b> planning, and next financial year's irrigation related to <b>ISD</b> budget is estimated.</p>
<p>Form-15: Monitoring Sheet for step 1-12</p>	<p>DIDT has to fill and submit four times during execution of Steps for Formulation</p>	<p>Summary of the steps executed</p>

**Form-1 List of Irrigation  
Schemes in the District  
(page... of...)**

Name of District \_\_\_\_\_

Prepared Date and Year \_\_\_\_\_

Prepared by \_\_\_\_\_

No	Name of Scheme	Ward	Village (s)	Present Irrigated Area	Potential area	Designed area	Developed area	Development stage	Distance from the headquarter
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									

## Form-2 Survey Sheet for Quick Site Inspection (1/2)

<b>1. General Information</b>	Surveyed Date: <input style="width: 100%;" type="text"/>
(1) Name of the scheme: .....	
(2) Location (any point in the scheme) : Latitude ..... : Longitude .....	
(3) Administration : Ward ..... : Village(s) .....	
(4) Number of households: ..... : households/ .....	
<b>2. Present Condition of the Potential Area (obtained from interview with villagers and confirmed by site visit)</b>	
2.1 Present Agricultural Conditions in the Potential Area	
(1) Present condition : <input type="checkbox"/> Not Cultivated <input type="checkbox"/> Cultivated ( ) ha in average year)	
(2) Present crops : <input type="checkbox"/> Paddy <input type="checkbox"/> Maize <input type="checkbox"/> Vegetable <input type="checkbox"/> Others ( )	
(3) Present markets : ..... ha ( km from the site)	
(4) Drainage problem : <input type="checkbox"/> No problem <input type="checkbox"/> partially affected <input type="checkbox"/> strongly affected	
(5) Flood : <input type="checkbox"/> Scarce <input type="checkbox"/> Once a year <input type="checkbox"/> More than twice a year	
2.2 Existing Irrigation System	
(1) Current irrigation system : <input type="checkbox"/> Traditional <input type="checkbox"/> Improved traditional	
<input type="checkbox"/> Modern <input type="checkbox"/> Rainwater harvesting <input type="checkbox"/> No irrigation	
(2) Present irrigated area : ..... ha (if the scheme area is already irrigated)	
(3) Main water source : <input type="checkbox"/> Perennial river <input type="checkbox"/> Seasonal river <input type="checkbox"/> Lake/Pond	
<input type="checkbox"/> Groundwater <input type="checkbox"/> Spring <input type="checkbox"/> Rain for water harvesting	
(4) Name of the water source: .....	
2.3 Existing Institution (organization or Group) Related with Agriculture/Irrigation	
(1) Establishment of Institution: <input type="checkbox"/> Established in year <input type="checkbox"/> not established yet	
(2) Name of the organization : .....	
(3) Registered year : .....	
(4) Number of members : ..... members.	
2.4 On-going support on irrigation development by government or some organization	
(1) Type of support : <input type="checkbox"/> Irrigation Facilities <input type="checkbox"/> Others ( ..... ) <input type="checkbox"/> None	
<b>3. Village Proposed Plan by O&amp;OD etc. (proposed development plan by village)</b>	
3.1 Irrigation System Development Plan	
(1) Potential area : ..... ha	
(2) Main water source : <input type="checkbox"/> Perennial river <input type="checkbox"/> Seasonal river <input type="checkbox"/> Lake/pond	
<input type="checkbox"/> Groundwater <input type="checkbox"/> Spring <input type="checkbox"/> Rain for water harvesting	
(3) Name of the water source : .....	
(4) Water rights : <input type="checkbox"/> Granted <input type="checkbox"/> Not granted yet <input type="checkbox"/> Intended <input type="checkbox"/> Not aware	

## Form-2 Survey Sheet for Quick Site Inspection (2/2)

- (5) Required works :  Rehabilitation  New development  
 Improvement (from traditional to modern)  Drainage improvement
- (6) Irrigation type :  Gravity  Pump  Treadle pump  Rain water harvesting
- (7) Water quality :  suitable for irrigation  not suitable for irrigation

### 3.2 Agriculture Development Plan

(1) Proposed crops:  Paddy  Maize  Vegetable  Others ( )

(2) Proposed markets: Name \_\_\_\_\_ (km from the site)

### 3.3 Irrigators' Organization Establishment Plan

(1) Establishment plan:  Established  Planned by year  not sure

(2) Mode of contribution to development:  In cash  In kind  none

## 4. Anticipated Negative Impacts

Water conflict within the scheme/village

- Land conflict  Effect on protected area  Soil erosion in the scheme

Cause of conflict ( \_\_\_\_\_ )

## 5. Observation by the Inspection Team

(1) Farmers motivation for irrigation:  High  Moderate  Low

(2) Present support to the scheme:  Enough  Additional support is required  none

## 6. Opinions of Village Officers and Beneficiaries

## 7. History of the Scheme

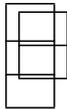
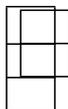
## 8. Findings of the District Project Development Team

# Form-3 Survey Sheet for Interview Survey with Stakeholders (1/3)

<b>Sub-step 3(a) Present Conditions of Agriculture and Marketing</b>																																																			
<b>Applicability</b> The sub-step should be applied to all schemes.																																																			
<b>1) Land Use in the Potential Area</b>	Scheme Name _____	Surveyed Date _____																																																	
<p>If the potential area is not clearly defined, agree with villagers on the potential area as village area, basin area or other area. If the cultivated area is not clear, estimate from the total household number and the average holding size. The village extension officer should confirm the villagers' answers in order to avoid odd data.</p> <p>(1) Potential Area (ha): _____</p> <p>(2) Cultivated Area within the Potential Area (ha): _____</p> <p>(3) Present Irrigated Area in the cultivated Area (ha): _____</p> <p>(4) Present Rainfed Area in the Cultivated Area (ha): _____</p> <p>(5) Average Holding Size/Family in the Potential Area (ha): _____</p> <p>(6) Total Household Number in the Potential Area: _____</p>																																																			
<p><b>2) Crop Production in the Potential Area</b></p> <p>Let the farmer's select two major rainy and dry season crops grown in the potential area. As for the yield and the price (farm gate price), ask farmers the maxima and minima in order to obtain average figures. Avoid any data for extraordinary years. The village extension officer should confirm the villagers' answers in order to avoid odd data.</p> <p><b>* Unit for Yield: bags/acre and weight/bag for cereals (paddy/maize), kg/acre for vegetables</b></p> <p><b>** Unit for Price: Tsh/bag and weight/bag for cereals (paddy/maize), Tsh/kg for vegetables</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 20%; text-align: center;">Rainy Season</th> <th style="width: 20%; text-align: center;">Dry Season</th> <th style="width: 30%;"></th> </tr> </thead> <tbody> <tr> <td>(1) Name of Crops:</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>(2) Cropped Area (ha):</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>(3) Rainfed or Irrigated:</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>(4) Month of Land Preparation:</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>(5) Month of Harvest:</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>(6) Maximum Yield*:</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>    Minimum Yield*:</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>    Weight/bag (kg):</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>(7) Maximum Price**:</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>    Minimum Price**:</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>    Weight/bag (kg):</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>					Rainy Season	Dry Season		(1) Name of Crops:	_____	_____	_____	(2) Cropped Area (ha):	_____	_____	_____	(3) Rainfed or Irrigated:	_____	_____	_____	(4) Month of Land Preparation:	_____	_____	_____	(5) Month of Harvest:	_____	_____	_____	(6) Maximum Yield*:	_____	_____	_____	Minimum Yield*:	_____	_____	_____	Weight/bag (kg):	_____	_____	_____	(7) Maximum Price**:	_____	_____	_____	Minimum Price**:	_____	_____	_____	Weight/bag (kg):	_____	_____	_____
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<p><b>3) Major Constraints to Crop Production</b></p> <p>Let the farmers select three major constraints to crop production in the potential area. Do not spend a long time for discussion; just try to understand the level of irrigation needed for the scheme.</p> <p>(1) _____ (2) _____ (3) _____</p>																																																			
<p><b>4) Farmers Supporting System</b></p> <p>Ask the following questions on technical assistance and extension services.</p> <p>(1) Technical Assistance      Available (extension)      Available (other party)      <input type="checkbox"/> Not available  on Irrigation</p> <p>(2) Extension Services:      Satisfied      Not satisfied (Reasons) _____</p>																																																			
<p><b>5) Input Supply for the Potential Area</b></p> <table style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 30%;">(1) Improved Seeds:</td> <td style="width: 30%;">In use: Amount _____</td> <td style="width: 40%;">Not in Use: Reason _____</td> </tr> <tr> <td>(2) Chemical Fertilizers:</td> <td>In use: Amount _____</td> <td>Not in Use: Reason _____</td> </tr> <tr> <td>(3) Agro-chemicals:</td> <td>In use: Amount _____</td> <td>Not in Use: Reason _____</td> </tr> <tr> <td>(4) Agricultural Machinery:</td> <td>In use: Amount _____</td> <td>Not in Use: Reason _____</td> </tr> </tbody> </table>				(1) Improved Seeds:	In use: Amount _____	Not in Use: Reason _____	(2) Chemical Fertilizers:	In use: Amount _____	Not in Use: Reason _____	(3) Agro-chemicals:	In use: Amount _____	Not in Use: Reason _____	(4) Agricultural Machinery:	In use: Amount _____	Not in Use: Reason _____																																				
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<p><b>6) Marketing System in the Potential Area</b></p> <table style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 30%;">(1) Market for Paddy:</td> <td style="width: 20%;">Middleman</td> <td style="width: 20%;">Local Market</td> <td style="width: 30%;">Town Market</td> </tr> <tr> <td>(2) Market for Vegetables:</td> <td>Middleman</td> <td>Local Market</td> <td>Town Market</td> </tr> </tbody> </table>				(1) Market for Paddy:	Middleman	Local Market	Town Market	(2) Market for Vegetables:	Middleman	Local Market	Town Market																																								
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<p><b>7) Possibility of Group Purchasing and Selling</b></p> <p>Since group purchasing and selling of inputs and products seems important for future development, ask the possibility in the future.</p> <p style="text-align: center;">High possibility through      Low possibility      No possibility</p>																																																			

# Form-3 Survey Sheet for Interview Survey with Stakeholders (2/3)

Sub-step 3(b) Present Conditions of Institutions			
<b>Applicability</b> This sub-step should be applied to proposed schemes where circled groups already exist.			
1) Existence of organization			
<input type="checkbox"/> Irrigators' Organization (IO) <input type="checkbox"/> Farmers' Group (FG) etc. <input type="checkbox"/> No organization			
	Scheme Name	Surveyed Date	
<b>1) General Information</b>			
(1) Name of IO/FG: _____			
<input type="checkbox"/> (2) Established Year of Irrigators' Organization: _____			
(3) Registration of Irrigators' Organization:                        National Irrigation Act                        Cooperative Act                        Association Act                        None			
(4) Number of Present Members: _____ People (Male _____ people, _____ Female people)			
(5) Area covered by Irrigators' Organization: _____ ha			
<b>2) Activities</b>			
(1) Frequency of Meetings:                        Weekly                        Monthly                        Half yearly                        Yearly                        According Needs                        No meeting                        NA			
General Meeting:                        Committees:                        Each canal group:			
(2) Documentation of Meeting Results:                        Done                        Not done			
(3) Major Issues Discussed and Decisions Made: _____			
(4) Have by-laws and regulations been adopted:                        Yes                        No                        Intended			
(5) Does IO/FG have a bank account?                        Yes                        Cash in hand                        Others NA			
(6) Does IO keep records?                        Yes                        No                        Not Applicable			
<b>3) Farmers' Contribution to the Construction/Repair Works</b>			
(1) Construction Works:                        In Kind                        In cash                        None			
(2) Repair Works:                        In kind                        In cash                        None			



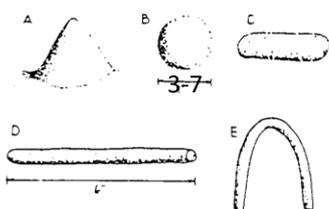
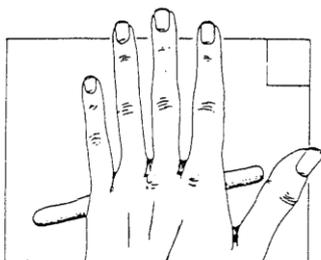
## Form-3 Survey Sheet for Interview Survey with Stakeholders (3/3)

Sub-step 3 (c) Present Conditions of Environment				
<b>Applicability</b> The sub-step should be applied to all schemes.				
		Scheme Name	Surveyed Date	
<b>1) Physical Conditions</b>				
(1) Siltation:	<input type="checkbox"/>	Significant	<input type="checkbox"/> Not significant	Not known
(2) Soil erosion:	<input type="checkbox"/>	Significant	<input type="checkbox"/> Not significant	Not known
(3) Salinity problem:	<input type="checkbox"/>	Significant	<input type="checkbox"/> Not significant	Not known
<b>2) Change in Ecosystems</b>				
(1) Vegetation degradation:	<input type="checkbox"/>	Significant	<input type="checkbox"/> Not significant	Not known
(2) Destructive animals:	<input type="checkbox"/>	Significant	<input type="checkbox"/> Not significant	Not known
(3) Aquatic plants:	<input type="checkbox"/>	Significant	<input type="checkbox"/> Not significant	Not known
<b>3) Agricultural Activity</b>				
(1) Water use conflict:	<input type="checkbox"/>	Significant	<input type="checkbox"/> Not significant	Not known
(2) Land use conflict:	<input type="checkbox"/>	Significant	<input type="checkbox"/> Not significant	Not known
(3) Loss of soil fertility:	<input type="checkbox"/>	Significant	<input type="checkbox"/> Not significant	Not known
<b>4) Sanitation and Public Health</b>				
(1) Soil and water pollution:	<input type="checkbox"/>	Significant	<input type="checkbox"/> Not significant	Not known
(2) Water borne diseases:	<input type="checkbox"/>	Significant	<input type="checkbox"/> Not significant	Not known
<b>5) Socio-economic Conditions</b>				
(1) Population increase (immigrant)	<input type="checkbox"/>	Significant	<input type="checkbox"/> Not significant	Not known
(2) Increase in water demand:	<input type="checkbox"/>	Significant	<input type="checkbox"/> Not significant	Not known
(3) Vandalism of structures:	<input type="checkbox"/>	Significant	<input type="checkbox"/> Not significant	Not known

Note: Next step of page 2-11 (d) should be continued.

Sub-step 1 Confirm Soil Texture of the Proposed area			
<b>Applicability</b> The sub-step can be skipped for non-circled type of scheme			
1) Type of irrigation			
<input type="checkbox"/> Gravity	<input type="checkbox"/> Pump (River)	<input type="checkbox"/> Pump (Lake/pond)	<input type="checkbox"/> Rain water harvesting
2) Type of irrigation development			
<input type="checkbox"/> Rehabilitation	<input type="checkbox"/> Improvement	<input type="checkbox"/> New Development	<input type="checkbox"/> Extension <input type="checkbox"/> Drainage
<b>Instruction</b>	Scheme Name	Surveyed Date	

## Form-4 Survey Sheet for Field Conditions Confirmation (1/7)



**1) Visit the survey together with village chairperson and villagers.**

Visit the proposed area and choose typical soil in the area with the consultation of the village chairperson and villagers.

**2) Sampling of the soil**

Gather a soil sample from the soil surface (sample should be about 10 x 10 x 10 cm).

**3) Knead the soil with water.**

Add some water to the soil sample so it is moist but not wet. Knead it well. Pebbles should be removed.

**4) Try to create ring shapes with the soil sample and choose the most advanced shape that can be made.**

A: Soil can only be shaped into a cone. No other shapes hold together.

B: Soil can be formed into a circle, but not a rod shape.

C: Soil can be formed into a stout rod shape.

D: A thin rod (about 6 mm diameter) can be formed but not bent.

E: Thin rod can be bent without breaking

F: Circle can be formed with some breaks.

G: Complete circle with no breaks can be formed.

**5) Evaluate the soil texture**

According to the result of 4), circle one of the detailed soil texture types and choose a general soil texture type by conversion of the detailed soil texture type.

Detailed soil texture type	conversion	General soil texture type
Shape A Sand	if you choose Shape A	Sand
Shape B Loamy sand	if you choose Shape B or C	Sandy Loam
Shape C Silty Loam		
Shape D Loam	if you choose Shape D or E	Clay Loam
Shape E Clay Loam		
Shape F Light Clay	if you choose Shape F or G	Clay
Shape G Heavy Clay		

**6) Notable Soil Characteristics**

If there are any notable soil characteristics such as high rock outcrop, shallow soil depth and symptom of salt accumulation, please note.

Note:

### Form-4 Survey Sheet for Field Conditions Confirmation (2/7)

Sub-step 2 Confirm Field Drainage Conditions			
<b>Applicability</b> The sub-step can be skipped for non-circled type of scheme			
1) Type of irrigation			
<input type="checkbox"/> Gravity	<input type="checkbox"/> Pump (River)	<input type="checkbox"/> Pump (Lake/pond)	<input type="checkbox"/> Rain water harvesting
2) Type of irrigation development			
<input type="checkbox"/> Rehabilitation	<input type="checkbox"/> Improvement	<input type="checkbox"/> New Development	<input type="checkbox"/> Extension <input type="checkbox"/> Drainage
<b>Instruction</b>	Scheme Name		Surveyed Date
1) <b>Interview with farmers</b>			
Inundation of proposed area in normal year		cm depth for	days
Highest flood water depth in the past		cm depth in (10-50 years)	

### Form-4 Survey Sheet for Field Conditions Confirmation (3/7)

Sub-step 3 Confirm Bridge and River Crossing Conditions			
<b>Applicability</b> The sub-step can be skipped for non-circled type of scheme			
1) Type of irrigation			
<input type="checkbox"/> Gravity	<input type="checkbox"/> Pump (River)	<input type="checkbox"/> Pump (Lake/pond)	<input type="checkbox"/> Rain water harvesting
2) Type of irrigation development			
<input type="checkbox"/> Rehabilitation	<input type="checkbox"/> Improvement	<input type="checkbox"/> New Development	<input type="checkbox"/> Extension <input type="checkbox"/> Drainage
<b>Instruction</b>	Scheme Name		Surveyed Date
1) <b>Observe bridge or river crossing points</b>			
River crossing	Number	nos.	Total length
crossing point(s) where provision of bridge is required.			m point(s) Survey river
Existing bridge(s)	Number	nos.	Total length
100 % replacement			50 % replacement 30 % replacement minor
rehabilitation			functioning well Facility not exist

### Form-4 Survey Sheet for Field Conditions Confirmation (4/7)

Sub-step 4 Confirm Intake Point Conditions			
<b>Applicability</b> The sub-step can be skipped for non-circled type of scheme			
1) Type of irrigation			
<input type="checkbox"/> Gravity	<input type="checkbox"/> Pump (River)	<input type="checkbox"/> Pump (Lake/pond)	<input type="checkbox"/> Rain water harvesting
2) Type of irrigation development			
<input type="checkbox"/> Rehabilitation	<input type="checkbox"/> Improvement	<input type="checkbox"/> New Development	<input type="checkbox"/> Extension <input type="checkbox"/> Drainage
<b>Instruction</b>	Scheme Name		Surveyed Date
1) <b>Determine intake point</b>			
Determine intake point (location of the weir). The intake point should be narrow, strait, moderate (not too gentle) steep (to avoid siltation), stable flow, intake side water-route (see figure on the right), geologically strong and have easy access.		Intake should be this side.	Water level
		Water-route (deepest point)	

Elevation of the intake point should not be very different from the elevation at the upstream-end of the command area of the main canal (see **Figure-2**). If you cannot find a suitable intake point, search upstream on the same river or change the water source to another river (if there is one). If you still cannot find a suitable place, because of flat river bed, go to 2) and choose "Seems No Good".

**2) Evaluate reliability of the intake water level**

Evaluate the reliability of the determined intake water level by referring to **Figure-2**. If you are not sure about the relationship between intake water level and the elevation of the proposed area, choose "Not sure"

Seems Good  Not sure  Seems  No Good

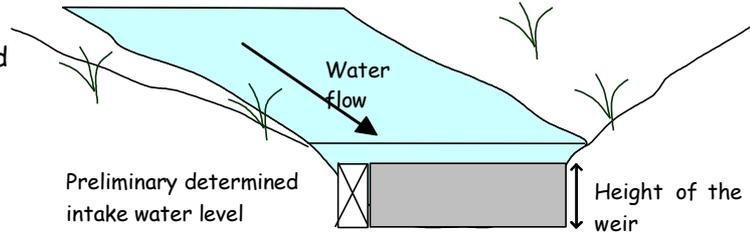
If it seems No Good, give up to irrigate the upstream part of the development area and find some lower land with elevation almost the same as the highest possible intake water level of the point.

**3) Estimate intake water level**

Estimate the intake water level (water level at the start point of the main canal). The intake water level should be almost the same or at a higher elevation than the upstream-end of the command area of the main canal and also be able to divert water to the main canal stably (it should not be very shallow). The water level should also be able to give some water depth for the main canal flow.

**4) Estimate weir height**

The elevation of the weir crest should be preliminarily determined as the same level as the intake water level. Estimate the weir height considering the intake water level and cross section of the river at intake point.



Estimated weir height (h)  m

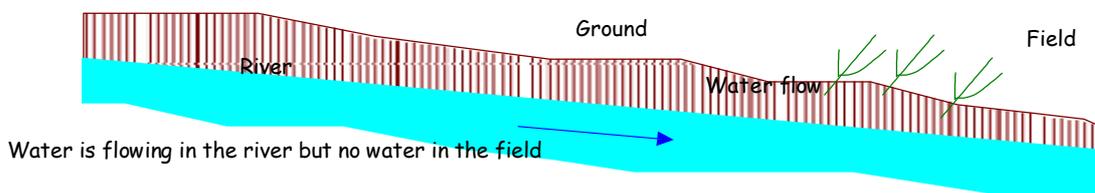
**5) Measure river width and depth at the intake point**

Width of river at the intake point  m

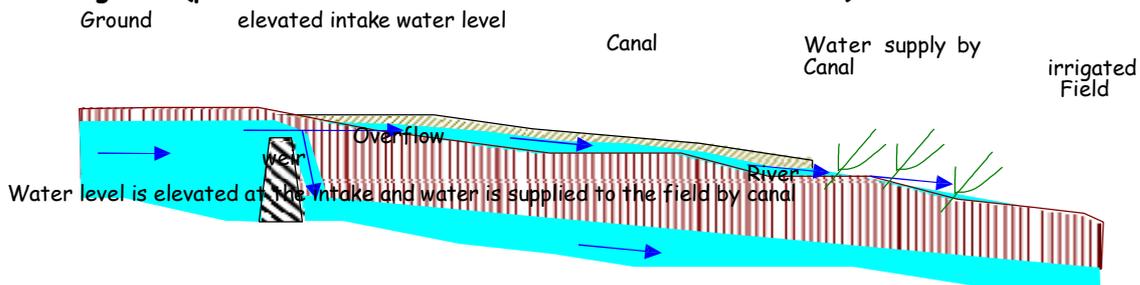
Depth of river at the intake point  m (depth of the river not water)

**Figure-2 Required Intake Water Level**

Before irrigation (profile along the water source in the river)



**After irrigation (profile of the water source in the river and canal)**



**Sub-step 5 Confirm Water Source River Conditions**

**Applicability** The sub-step can be skipped for non-circled type of scheme

1) Type of irrigation

Gravity     Pump (River)     Pump (Lake/pond)     Rain water harvesting

2) Type of irrigation development

Rehabilitation     Improvement     New Development     Extension     Drainage

**Instruction**

Scheme Name

Surveyed Date

**1) Determine measurement point together with village chairperson and villagers**

Find a suitable point for measurement together with the villagers. The measurement point should be a) narrow, b) strait, c) steep, and d) upstream of any existing intake, or e) near the proposed intake site. In case of pump (lake/pond), major inflow to the lake/pond should be measured, if there is any. If there is no major inflow, proceed to sub-step 3.

**2) Estimate flow area on the day of survey**

Measure average river width and water depth on the day of survey.

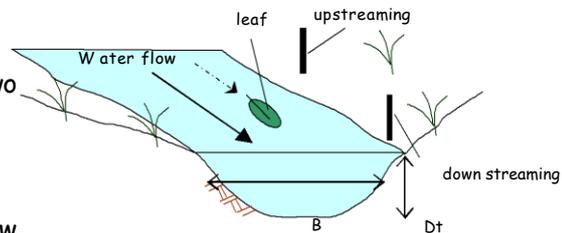
B =                      m (average river width) Dt =                      m (water depth on the day of survey)

At =                      m<sup>2</sup> (flow area of the day of survey) (At = B x Dt)

**3) Measure water flow velocity of the day**

a) Drive two twigs into the ground along the river at a measured distance between the two twigs.

b) Float a leaf on the water from the upstream twig to the downstream twig and measure the travel time. c) Calculate the flow velocity.



Ls =                      m (length between twigs)    Tt =                      sec (travel time)

Vt =                      m/sec (V t = Ls/ Tt)

**4) Calculate river discharge on the day of survey**

Qt =                      m<sup>3</sup>/sec (discharge on the day of survey) (Qt = At x Vt)

**5) Estimate water depth at critical/average month in dry and rainy season**

For gravity, pump (river) and rain water harvesting scheme, ask villagers which are the critical months (month in which most drought occurs) for rainy and dry season. Obtain water depth in those months by interviewing the villagers.

For pump irrigation, obtain water depth in average discharge months in each season.

Dry season    Critical/average month  m (Dd; water depth)

Rainy season    Critical/average month  m (Dr; water depth)

**6) Water flow month**

Dry season    from  to

Rainy season    from  to

**7) Estimate discharge at critical/average month in dry and rainy season**

Qd =  m<sup>3</sup>/sec ( Qd = Qt x (Dd/Dt)<sup>2</sup>)

Qr =  m<sup>3</sup>/sec ( Qr = Qt x (Dr/Dt)<sup>2</sup>)

**8) Nominate river discharge record keeper**

One villager who lives near the water source river should be nominated as the river discharge record keeper by the village chairperson. The keeper should measure the water level and velocity of the measurement point once every month.

Nominated name of the record keeper

**Sub-step 6 Confirm Water Source Lake/Pond Conditions**

**Applicability** The sub-step can be skipped for non-circled type of scheme

1) Type of irrigation

Gravity     Pump (River)     Pump (Lake/pond)     Rain water harvesting

2) Type of irrigation development

Rehabilitation     Improvement     New Development     Extension     Drainage

**Instruction**

Scheme Name

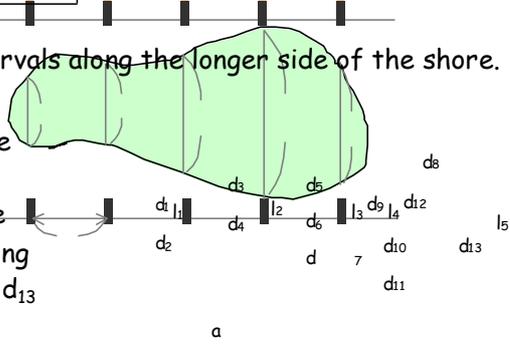
Surveyed Date

**1) Preparatory arrangement**

Visit the site and drive twigs at regular intervals along the longer side of the shore.

**2) Measure surface width and depth**

Stretch a tape across the shore at the place pointed by the twigs. Then, a) measure the surface width (width of  $l_1$  to  $l_5$  in figure in the right), while b) measure the water depth along the tape at regular intervals (depth of  $d_1$  to  $d_{13}$  in figure in the right).



**3) Calculate capacity of the pond/lake**

A=                       $m^2$  (average surface area)                      D=                      m (average depth)

V=                       $m^3$  (capacity of the pond/lake) ( $V = A \times D$ )

**Form-4 Survey Sheet for Field Condition Confirmation (7/7)**

**Sub-step 7 Confirm Existing Irrigation and Drainage Facilities Condition**

**Applicability** The sub-step can be skipped for non-circled type of scheme

1) Type of irrigation

Gravity     Pump (River)     Pump (Lake/pond)     Rain water harvesting

2) Type of irrigation development

Rehabilitation     Improvement     New Development     Extension     Drainage

<b>Instruction</b>	Scheme Name	Surveyed Date
--------------------	-------------	---------------

**1) Observe and evaluate the structures**

Observe major facilities together with village chairperson or IO chairperson. Evaluate conditions of the facilities by extent of required replacement and circle one of them.

Weir and Intake    Width \_\_\_\_\_m    Height \_\_\_\_\_m

100 % replacement     50 % replacement     30 % replacement     No replacement

Pump(s)    Number \_\_\_\_\_nos.

100 % replacement     50 % replacement     30 % replacement     No replacement

Main Canal System    Length \_\_\_\_\_m (evaluation includes related structures)

100 % replacement     50 % replacement     30 % replacement     No replacement

Secondary Canal System (evaluation includes related structures)

100 % replacement     50 % replacement     30 % replacement     No replacement

Drainage System (evaluation includes related structures)

100 % replacement     50 % replacement     30 % replacement     No replacement

Flood Dike    Length \_\_\_\_\_m

100 % replacement     50 % replacement     30 % replacement     No replacement

# Form-5 Calculation Sheet for Irrigation Water Requirement

## Sub-step 1 Estimate Gross Water Requirement

<b>Instruction</b>	Scheme Name	Planned Date
--------------------	-------------	--------------

### 1) Determine crops to be irrigated

Determine the crops to be irrigated considering present crop production surveyed in **Form-3 (1/3)**, the agro-ecological zone obtained from the irrigation GIS, and the farmers' Intentions for cropping after the scheme is implemented. **Choose one crop for dry season and rainy season respectively.**

**Dry season:** Paddy Maize Beans and Vegetables

**Rainy season:** Paddy Maize Beans and Vegetables

### 2) Setting-up a typical cropping calendar

In order to simplify the water requirement calculation, the typical, ideal cropping calendar under irrigated conditions was established in the Action Plan study. This calendar, as shown below, was based on the following conditions.

- The major strategic crop for the irrigation development is paddy and the effective utilization of the long rains between March and May (Masika) is the key issue.
- Since irrigated conditions are assumed, the land preparation can be performed within 1 month and the rainy season cropping can thus be started around January.
- In this case, the harvesting can be carried out around June and that period is ideal for the harvest of paddy because of the dry conditions just after the long rains.
- The double cropping of paddy is possible if the irrigation water is available during the dry season starting from July.
- Even if the irrigation water is not sufficient during the dry season, some crops can be grown under the effective utilization of the remaining soil moisture.

**Typical Cropping Calendar**

Seasons	Dry season cropping						Rainy Season cropping					
	1st	2nd	3rd	4th	5th	6th	1st	2nd	3rd	4th	5th	6th
Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun

### 3) Enter net unit water requirement (NWR)

Obtain net unit water requirement (NWR) from **Table-1**. General soil texture type is confirmed from **Form-4 (1/7)**.

### 4) Obtain irrigation efficiency (E)

Irrigation efficiency (E)

Obtain suitable irrigation efficiency from **Table-2**.

### 5) Calculate gross unit water requirement (GWR)

**Calculation Form of Gross Unit Water Requirement**

(Unit: mm/month)

		Dry season						Rainy season					
Crop to be irrigated													
Name of the Month		1st	2nd	3rd	4th	5th	6th	1st	2nd	3rd	4th	5th	6th
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Net unit water requirement (mm/month)	Table-1												
Gross unit water requirement (GWR) (l/sec/ha)	NWR/E /8.64/ D*												

\*D :number of days by the month,

**Table-1 Net Unit Water Requirement (NWR) in each Region (1/2)**

Unit: mm/month

Region	Crop	Soil Type	Dry Season						Rainy Season					
			Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Arusha	Paddy	Sandy Loam	637	460	502	501	-	-	686	465	484	358	390	-
		Clay Loam	432	310	352	346	-	-	481	325	329	208	235	-
		Clay	289	220	262	253	-	-	338	241	236	118	142	-
	Maize		90	112	194	191	144	-	45	124	165	58	75	-
	Bean & Veg		90	112	169	172	-	-	49	111	149	66	72	-
Kilimanjaro	Paddy	Sandy Loam	633	461	507	512	-	-	736	506	540	403	406	-
		Clay Loam	428	311	357	357	-	-	531	366	385	253	251	-
		Clay	285	221	267	264	-	-	388	282	292	163	158	-
	Maize		89	112	198	202	187	-	72	157	220	103	90	-
	Bean & Veg		89	112	172	182	-	-	72	138	193	102	85	-
Tanga	Paddy	Sandy Loam	658	456	474	470	-	-	732	500	522	374	340	-
		Clay Loam	453	306	324	315	-	-	527	360	367	224	185	-
		Clay	310	216	234	222	-	-	384	276	274	134	92	-
	Maize		85	102	166	160	139	-	70	153	203	74	23	-
	Bean & Veg		90	108	148	148	-	-	70	134	180	82	40	-
Iringa	Paddy	Sandy Loam	703	527	569	564	-	-	622	427	447	433	473	-
		Clay Loam	498	377	419	409	-	-	417	287	292	283	318	-
		Clay	355	287	329	316	-	-	274	203	199	193	225	-
	Maize		112	158	257	254	230	-	0	100	129	133	155	-
	Bean & Veg		112	158	224	228	-	-	13	89	120	123	139	-
Mbeya	Paddy	Sandy Loam	689	510	548	532	-	-	555	402	388	394	457	-
		Clay Loam	484	360	398	377	-	-	350	262	233	244	302	-
		Clay	341	270	308	284	-	-	207	178	140	154	209	-
	Maize		107	146	237	222	173	-	0	82	71	94	140	-
	Bean & Veg		107	146	206	200	-	-	0	73	74	92	125	-
Rukwa	Paddy	Sandy Loam	696	519	558	548	-	-	589	415	417	414	465	-
		Clay Loam	491	369	408	393	-	-	384	275	262	264	310	-
		Clay	348	279	318	300	-	-	241	191	169	174	217	-
	Maize		109	152	247	238	202	-	0	91	100	114	148	-
	Bean & Veg		109	152	215	214	-	-	0	81	97	107	132	-
Coast	Paddy	Sandy Loam	670	486	515	497	-	-	714	479	430	318	379	-
		Clay Loam	465	336	365	342	-	-	509	339	275	168	224	-
		Clay	322	246	275	249	-	-	366	255	182	78	131	-
	Maize		100	129	206	187	140	-	64	138	112	18	63	-
	Bean & Veg		100	129	179	170	-	-	65	121	109	37	67	-
D'Salaam	Paddy	Sandy Loam	665	484	511	491	-	-	703	478	440	347	381	-
		Clay Loam	460	334	361	336	-	-	498	338	285	197	226	-
		Clay	317	244	271	243	-	-	355	254	192	107	133	-
	Maize		96	127	202	181	151	-	53	137	122	47	64	-
	Bean & Veg		97	128	176	165	-	-	56	120	115	57	68	-
Morogoro	Paddy	Sandy Loam	627	450	485	485	-	-	673	445	426	325	381	-
		Clay Loam	422	300	335	330	-	-	468	305	271	175	226	-
		Clay	279	210	245	237	-	-	325	221	178	85	133	-
	Maize		86	104	177	175	161	-	34	111	109	25	66	-
	Bean & Veg		87	104	154	158	-	-	42	99	104	39	65	-
Lindi	Paddy	Sandy Loam	700	513	530	518	-	-	622	443	381	383	455	-
		Clay Loam	495	363	380	363	-	-	417	303	226	233	300	-
		Clay	352	273	290	270	-	-	274	219	133	143	207	-
	Maize		110	148	220	208	195	-	0	111	64	83	137	-
	Bean & Veg		111	148	192	187	-	-	6	99	71	86	125	-
Mtwara	Paddy	Sandy Loam	700	513	530	518	-	-	622	443	381	383	455	-
		Clay Loam	495	363	380	363	-	-	417	303	226	233	300	-
		Clay	352	273	290	270	-	-	274	219	133	143	207	-
	Maize		110	148	220	208	195	-	0	111	64	83	137	-
	Bean & Veg		111	148	192	187	-	-	6	99	71	86	125	-
Ruvuma	Paddy	Sandy Loam	663	484	534	539	-	-	538	422	359	383	445	-
		Clay Loam	458	334	384	384	-	-	333	282	204	233	290	-
		Clay	315	244	294	291	-	-	190	198	111	143	197	-
	Maize		99	128	224	229	211	-	0	96	42	83	128	-
	Bean & Veg		99	128	195	206	-	-	0	85	54	83	115	-
Kagera	Paddy	Sandy Loam	664	451	424	357	-	-	579	361	337	242	294	-
		Clay Loam	459	301	274	202	-	-	374	221	182	92	139	-
		Clay	316	211	184	109	-	-	231	137	89	2	46	-
	Maize		97	100	117	47	8	-	0	40	20	0	0	-
	Bean & Veg		98	105	108	56	-	-	0	44	38	0	4	-

**Table-1 Net Unit Water Requirement (NWR) in each Region (2/2)**

Unit: mm/month

Region	Crop	Soil Type	Dry Season						Rainy Season					
			Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Mara	Paddy	Sandy Loam	696	509	530	478	-	-	672	453	479	365	411	-
		Clay Loam	491	359	380	323	-	-	467	313	324	215	256	-
		Clay	348	269	290	230	-	-	324	229	231	125	163	-
	Maize		109	145	220	168	118	-	43	117	160	65	94	-
	Bean & Veg		109	146	191	154	-	-	47	104	146	75	92	-
Mwanza	Paddy	Sandy Loam	713	514	528	468	-	-	625	440	461	376	443	-
		Clay Loam	508	364	378	313	-	-	420	300	306	226	288	-
		Clay	365	274	288	220	-	-	277	216	213	136	195	-
	Maize		114	149	219	158	83	-	9	109	143	76	125	-
	Bean & Veg		114	149	190	146	-	-	21	97	132	82	116	-
Shinyanga	Paddy	Sandy Loam	727	545	577	523	-	-	619	441	449	424	475	-
		Clay Loam	522	395	427	368	-	-	414	301	294	274	320	-
		Clay	379	305	337	275	-	-	271	217	201	184	227	-
	Maize		119	170	265	213	140	-	0	110	130	124	156	-
	Bean & Veg		119	170	231	192	-	-	12	97	124	120	141	-
Dodoma	Paddy	Sandy Loam	719	537	568	555	-	-	667	447	505	475	496	-
		Clay Loam	514	387	418	400	-	-	462	307	350	325	341	-
		Clay	371	297	328	307	-	-	319	223	257	235	248	-
	Maize		116	165	257	245	230	-	22	114	185	175	177	-
	Bean & Veg		116	165	223	220	-	-	34	101	166	159	158	-
Kigoma	Paddy	Sandy Loam	702	517	528	435	-	-	584	408	418	373	452	-
		Clay Loam	497	367	378	280	-	-	379	268	263	223	297	-
		Clay	354	277	288	187	-	-	236	184	170	133	204	-
	Maize		111	151	219	125	55	-	0	86	102	73	135	-
	Bean & Veg		111	151	190	118	-	-	0	77	96	77	121	-
Singida	Paddy	Sandy Loam	745	563	637	545	-	-	589	413	440	413	478	-
		Clay Loam	540	413	487	390	-	-	384	273	285	263	323	-
		Clay	397	323	397	297	-	-	241	189	192	173	230	-
	Maize		125	183	323	235	152	-	0	90	122	113	160	-
	Bean & Veg		125	183	281	212	-	-	0	80	116	110	143	-
Tabora	Paddy	Sandy Loam	745	563	637	545	-	-	589	413	440	413	478	-
		Clay Loam	540	413	487	390	-	-	384	273	285	263	323	-
		Clay	397	323	397	297	-	-	241	189	192	173	230	-
	Maize		125	183	323	235	152	-	0	90	122	113	160	-
	Bean & Veg		125	183	281	212	-	-	0	80	116	110	143	-

**Table-2 Irrigation Efficiency by Scheme Condition**

Proposed canal condition	Lined	Unlined	
Farmers' experience	-	Sufficient	Poor
Irrigation efficiency	0.40	0.30	0.25

## Form-6(a) Calculation Sheet for Water Balance Study (River)

Sub-step 1 Water balance calculation (river water source)														
Applicability The sub-step can be skipped for non-circled type of scheme														
1) Type of irrigation														
<input type="checkbox"/>	Gravity	<input type="checkbox"/>	Pump (River)	<input type="checkbox"/>	Pump (Lake/pond)	<input type="checkbox"/>	Rain water harvesting							
Instruction		Scheme Name				Planned Date								
<p><b>1) Obtain river discharge of the critical months</b> Obtain river discharge for the critical months of the rainy and dry seasons (<math>Q_d</math> and <math>Q_r</math>) from <b>Form-4 (5/7)</b> and enter the values into the calculation form below. For other months, enter "-".</p> <p><b>2) Calculate 80% dependable river discharge</b> Calculate 80% dependable river discharge by multiplying <math>Q_d</math> and <math>Q_r</math> by 0.6.</p> <p><b>3) Obtain and enter gross unit water requirement (GWR)</b> Obtain gross unit water requirement (GWR) for 12 months from <b>Form-5</b> and enter the value in the calculation form below.</p> <p><b>4) Calculate irrigable area in the dry and rainy season</b> Calculate the irrigable area of each month and determine the irrigable area in the rainy season and dry season using the following calculation form.</p>														
<b>Calculation Form for Water Balance Study (River)</b>												(Unit: m <sup>3</sup> /sec)		
Month		Dry season						Rainy season						
		1st Jul	2nd Aug	3rd Sep	4th Oct	5th Nov	6th Dec	1st Jan	2nd Feb	3rd Mar	4th Apr	5th May	6th Jun	
River discharge (1)														
80% dependable river discharge (2)		(1) x 0.6												
GWR (3)														
Irrigable Area (ha) in the month (4)		(2)/(3) x 1000												
Irrigable Area (ha) in the season		minimum of (4) in the season												
<p>Note: (1) If river discharge data is available for only one month of each season, the water balance can only be made for that month.</p> <p>(2) If water requirement in the critical month is "-", shift the critical month to the nearest month for which water requirement is available.</p>														
<p><b>4) Determine development area (area to be provided with irrigation facilities)</b> Obtain the size of the proposed area from the present situation map by counting the squares in the map. Compare the area of the proposed area with the irrigable area in the rainy season; the smaller value should be chosen as the development area.</p> <p>Proposed area (i) <input style="width: 100px;" type="text"/> ha</p> <p>Irrigable area in rainy season (ii) <input style="width: 100px;" type="text"/> ha</p> <p><b>Development area</b> (smaller value of (i) and (ii)) <input style="width: 100px;" type="text"/> ha</p>														

## Form-6(b) Calculation Sheet for Water Balance Study (Lake/Pond)

Sub-step 2 Water balance calculation (lake/pond water source)												
Applicability The sub-step can be skipped for non-circled type of scheme												
1) Type of irrigation												
<input type="checkbox"/> Gravity <input type="checkbox"/> Pump (River) <input type="checkbox"/> Pump (Lake/pond) <input type="checkbox"/> Rain water harvesting												
Instruction	Scheme Name							Planned Date				
<p><b>1) Calculate rainfall recharge (see Table-3 and Form-4 (6/7))</b>                      Recharge for each of the 12 months and enter on the calculation form. Rainfall recharge (<math>m^3</math>) = dependable rainfall (mm) x surface area of lake/pond (<math>m^2</math>) /1000</p> <p><b>2) Obtain inflow discharge to the lake/pond</b>                      Obtain the average river discharge (<math>Q_d</math> and <math>Q_r</math>) to the lake/pond from Form-4 (5/7), if any. Enter the average discharge in dry season (<math>Q_d</math>; the same value) for each of the 6 months. Enter the average rainy season discharge for each month of the rainy season (<math>Q_r</math>).</p> <p><b>3) Calculate evaporation from the surface</b>                      Obtain <math>ETo</math> from Table-4 and surface area of the lake/pond from Form-4 (6/7). Calculate evaporation for 12 months and enter the result on the calculation form. Evaporation (<math>m^3</math>) = <math>ETo</math> (mm) x surface area of the lake/pond (<math>m^2</math>) /1000</p> <p><b>4) Calculate diversion water requirement (DWR)</b>                      Assume some development area (A). Calculate the diversion water requirement (DWR) by multiplying (A) and gross unit water requirement (GWR) calculated in Form-5.                      Assumed development area (A) <input style="width: 50px;" type="text"/> ha</p> <p><b>5) Obtain capacity of the lake/pond and surface area</b>                      Obtain the capacity of the lake/pond from Form-4 (6/7).</p> <p><b>6) Calculate the storage of the month</b>                      Calculate storage of each month, <math>Q_n</math>, from storage of the previous month, <math>Q_{(n-1)}</math>, and inputs and outputs for the month. For the first month, <math>Q_{(n-1)}</math> should be the capacity in 5).                      If the calculated storage is larger than the capacity obtained in 5), enter the capacity in 5) Instead of the calculated value.</p>												
Calculation Form for Water Balance Study (Lake/Pond) (Unit: $m^3$ )												
Month	Dry season						Rainy season					
	1st Jul	2nd Aug	3rd Sep	4th Oct	5th Nov	6th Dec	1st Jan	2nd Feb	3rd Mar	4th Apr	5th May	6th Jun
Rainfall recharge (1)												
Average inflow (2)												
80% dependable inflow (3)												
Evaporation (4)												
DWR (5)												
Storage of the month ( $Q_n$ )												

**7) Determine development area (area to be provided with irrigation facilities)**  
 If the calculated storage in a month is negative, or storage in the last month of the rainy season is less than obtained capacity in 5), decrease the assumed development area and Re-calculate until these conditions are not met to obtain final development area.  
**Development area**  ha (the area also can be recognized as the Irrigable area for both the dry and rainy season)

Calculation Should Start from The dry Season and Continue One year

**Table-3 Monthly 80% Dependable Rainfall in each Region**

Unit: mm/month

Region	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Arusha	0.2	0.0	0.0	1.1	22.3	35.1	23.3	21.5	45.4	105.7	41.9	0.6
Kilimanjar	0.1	0.0	0.0	0.1	1.4	7.5	0.6	1.2	15.3	76.6	39.2	0.2
Tanga	25.5	31.5	32.5	33.0	38.8	22.1	0.9	0.1	31.3	116.2	155.6	12.0
Iringa	0.0	0.0	0.0	0.0	0.4	44.8	83.1	12.0	69.5	24.1	0.1	0.0
Mbeya	0.0	0.0	0.0	0.7	16.2	110.2	143.3	12.0	112.7	54.2	0.1	0.0
Rukwa	0.0	0.0	0.0	0.3	8.3	77.5	113.2	12.0	91.1	39.1	0.1	0.0
Coast	2.2	1.2	0.0	8.5	46.2	34.5	1.3	0.0	98.9	154.8	86.6	2.2
D'Salaam	8.2	4.8	5.2	17.6	31.3	10.0	17.5	1.2	85.7	114.5	84.6	12.0
Morogoro	1.4	0.1	0.1	1.5	3.6	22.6	37.3	18.6	88.2	129.2	45.4	12.0
Lindi	0.2	0.2	0.6	0.7	4.0	67.8	107.2	12.0	142.1	91.0	16.3	0.1
Mtwara	0.2	0.2	0.6	0.7	4.0	67.8	107.2	12.0	142.1	91.0	16.3	0.1
Ruvuma	0.0	0.0	0.0	0.0	4.0	79.9	192.0	12.0	159.3	62.7	0.4	0.0
Kagera	3.9	26.7	55.8	104.7	138.9	110.9	97.3	75.9	189.6	250.6	187.9	25.6
Mara	0.1	1.3	2.6	23.9	47.5	28.1	17.0	17.6	57.6	124.2	67.6	2.6
Mwanza	0.0	0.0	0.2	32.1	88.6	83.1	58.2	12.0	66.7	105.3	27.5	0.0
Shinyanga	0.0	0.0	0.0	0.9	45.7	56.5	81.1	12.0	99.8	62.0	9.1	0.0
Dodoma	0.0	0.0	0.0	0.0	0.0	11.0	59.2	12.0	49.9	7.2	0.0	0.0
Kigoma	0.0	0.0	0.1	39.6	92.2	96.1	89.0	12.0	74.3	89.5	4.0	0.0
Singida	0.0	0.0	0.0	0.5	38.0	105.9	89.9	12.0	87.8	68.1	0.9	0.0
Tabora	0.0	0.0	0.0	0.5	38.0	105.9	89.9	12.0	87.8	68.1	0.9	0.0

**Table-4 Monthly Reference Evapo-transpiration (ETo) in each Region**

Unit: mm/month

Region	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Arusha	115	139	169	192	168	164	174	174	171	132	109	105
Kilimanjaro	112	140	172	202	198	202	206	198	201	156	124	105
Tanga	151	155	164	183	175	188	202	192	195	155	139	149
Iringa	176	197	224	254	243	198	155	135	155	150	163	161
Mbeya	163	183	206	222	194	170	132	113	130	132	148	147
Rukwa	169	190	215	238	218	184	143	124	143	141	155	154
Coast	146	163	179	193	182	177	186	173	158	127	130	138
D'Salaam	146	163	179	193	182	177	186	173	158	127	130	138
Morogoro	107	130	154	176	172	176	172	155	148	116	103	97
Lindi	173	186	192	208	208	196	170	149	142	146	156	154
Mtwara	173	186	192	208	208	196	170	149	142	146	156	154
Ruvuma	139	160	195	229	225	179	148	131	134	127	135	129
Kagera	142	148	136	120	111	114	125	117	133	117	115	126
Mara	170	183	193	184	160	163	158	161	174	152	149	150
Mwanza	184	186	190	180	153	155	142	147	165	150	152	158
Shinyanga	197	213	231	214	181	170	150	147	174	167	171	181
Dodoma	190	206	223	245	242	207	181	152	191	180	186	185
Kigoma	175	189	190	153	126	119	124	118	134	136	145	147
Singida	214	229	281	236	188	150	129	123	160	160	169	185
Tabora	214	229	281	236	188	150	129	123	160	160	169	185

# Form-7 Planning Sheet for Scheme Development Plan (1/10)



Gate leaf area (iii)	<input type="text"/>	m <sup>2</sup>	x Unit cost	<input type="text"/>	Tsh/m <sup>2</sup> =	<input type="text"/>	Tsh
(1) Cost of weir body (Subtotal ( i + ii ), in case of Gate type (iii))						<input type="text"/>	Tsh
(2) Miscellaneous works and contingency (50%of(1))						<input type="text"/>	Tsh
(3)Cost for new weir/intake ( (1) + (2) )						<input type="text"/>	Tsh
(4) Extent of required replacement						<input type="text"/>	Tsh
For new development or improvement scheme, enter factor 1.0.							
For rehabilitation scheme, choose extent of required replacement (1.0(=100%), 0.5 or 0.3) from <b>Form-4 (7/7)</b> . Minor rehabilitation can be omitted.							
(5) Construction/Rehabilitation cost of the weir/intake(3)x(4)						<input type="text"/>	Tsh

**Form-7 Planning Sheet for Scheme Development Plan (2/10)**

<b>Sub-step 1(b) Preliminary Design and Cost Estimate for Pump</b>															
<b>Applicability</b> The sub-step can be skipped for non-circled type of scheme															
1) Type of irrigation															
<input type="checkbox"/> Gravity	<input type="checkbox"/> Pump (River)	<input type="checkbox"/> Pump (Lake/pond)	<input type="checkbox"/> Rain water harvesting												
2) Type of irrigation development															
<input type="checkbox"/> Rehabilitation	<input type="checkbox"/> Improvement	<input type="checkbox"/> New Development	<input type="checkbox"/> Drainage												
<b>Instruction</b>	Scheme Name		Planned Date												
<p><b>1) Determine water abstraction point</b> Determine water abstraction point and plot it on the present situation map.</p> <p><b>2) Measure head of the pump</b> Measure required head of the pump (difference between ground elevation of the water abstraction point and lowest water level). (1) Required head of the pump <input style="width: 100px;" type="text"/> m</p> <p><b>3) Obtain total capacity of the pumps</b> Obtain total capacity of the pumps by multiplying peak (maximum) gross unit water requirement by development area. (1) Peak gross unit water requirement <input style="width: 100px;" type="text"/> l/sec/ha (2) Development area <input style="width: 100px;" type="text"/> ha (3) Total capacity of the pumps (1) x (2) x 3.6 (i) <input style="width: 100px;" type="text"/> m<sup>3</sup>/hr</p> <p><b>4) Determine maximum possible capacity of single pump</b> Obtain maximum possible capacity of single pump by required head using following table.</p> <p style="text-align: center;"><b>Table-5 Maximum Possible Capacity of Single Pump by Require Head</b></p> <table border="1" style="width: 100%; border-collapse: collapse; margin: 5px 0;"> <thead> <tr style="background-color: #cccccc;"> <th style="width: 20%;">Required Head</th> <th style="width: 15%;">0-5 m</th> <th style="width: 15%;">5-10 m</th> <th style="width: 15%;">10-15 m</th> <th style="width: 15%;">15-20 m</th> <th style="width: 20%;">20-25 m</th> </tr> </thead> <tbody> <tr> <td>Possible Max Capacity of Single Pump (m<sup>3</sup>/hr)</td> <td style="text-align: center;">80</td> <td style="text-align: center;">75</td> <td style="text-align: center;">65</td> <td style="text-align: center;">50</td> <td style="text-align: center;">25</td> </tr> </tbody> </table> <p>(1) Possible Maximum Capacity of Single Pump (ii) <input style="width: 100px;" type="text"/> m<sup>3</sup>/hr</p> <p><b>5) Determine required number of pumps</b> Determine the required number of pumps by dividing the total capacity of pumps by the maximum possible capacity of single pump (if the required number of pumps turns out to be more than 10, reduce the development area or change the type of crops to be irrigated or find a larger pump by consultation with the ZIO/RIO). (1) Required number of pumps (i)/(ii) (rounded up integer) <input style="width: 100px;" type="text"/> nos. (iii)</p> <p><b>6) Estimate cost of pumps</b> Estimate the cost of pumps by multiplying the cost of a single pump _____ (Tsh.) by the number of required pumps (1) Cost of required number of pumps (pump unit cost x(iii)) <input style="width: 100px;" type="text"/> Tsh. (2) Miscellaneous works and contingency <input style="width: 100px;" type="text"/> (1) Tsh. (3) Total cost of <input style="width: 100px;" type="text"/> pumps</p>				Required Head	0-5 m	5-10 m	10-15 m	15-20 m	20-25 m	Possible Max Capacity of Single Pump (m <sup>3</sup> /hr)	80	75	65	50	25
Required Head	0-5 m	5-10 m	10-15 m	15-20 m	20-25 m										
Possible Max Capacity of Single Pump (m <sup>3</sup> /hr)	80	75	65	50	25										

## Form-7 Planning Sheet for Scheme Development Plan (3/10)

Sub-step 1(c) Preliminary Design and Cost Estimate for Main Canal/Associated structures System		
<u>Applicability</u>	The sub-step can be skipped for non-circled type of scheme	
1) Type of irrigation	<input type="checkbox"/> Gravity <input type="checkbox"/> Pump (River) <input type="checkbox"/> Pump (Lake/pond) <input type="checkbox"/> Rain water harvesting	
2) Type of irrigation development	<input type="checkbox"/> Rehabilitation <input type="checkbox"/> Improvement <input type="checkbox"/> New Development <input type="checkbox"/> Drainage	
<u>Instruction</u>	Scheme Name	Planned Date
<p><b>1) Obtain length of the main canal</b>                      Seek preliminary route of the main canal, if there is no existing main canal. The route can be obtained to follow more or less the same elevation as the upstream-end of the command area of the main canal towards the intake site. Plot the route of the main canal on the present situation map and measure its length.</p> <p><b>2) Obtain command area of the main canal</b>                      Obtain the command area of the main canal. Not only the development area for this <b>ISD</b>, which was determined in the <b>Form-6 (a) or (b)</b>, but all the area that water is supplied by the main canal should be the command area of the main canal.</p> <p><b>3) Choose type of the main canal</b>                      Choose the type of main canal. If the budget is limited or future expansion is planned, choose unlined canal, considering future enlargement of the canal capacity. If not, choose lined canal, since it needs less maintenance work. Circle one option at right.</p> <p><b>4) Estimate construction cost for the main canal system</b>                      Estimate the construction cost for the main canal and structures based on the length of the main canal and the unit cost classified by command area and type of canal.</p> <p>a) Basic cost of the main canal system                      Length of canal <input type="text"/> m x Unit cost <input type="text"/> Tsh/m = <input type="text"/> Tsh                      (i)</p> <div style="border: 1px dashed black; padding: 5px; margin: 5px 0;"> <p>For a rehabilitation scheme, obtain the extent of required replacement of the main canal and structures from <b>Form-4 (7/7)</b>. The unit cost for a rehabilitation scheme can be estimated by multiplying the extent of required replacement (1.0(=100%), 0.5 or 0.3) by the unit cost for a new development and improvement. Minor rehabilitation can be omitted.</p> </div> <p>b) Contingency (10% of (i)) (ii) <input type="text"/> Tsh</p> <p>c) Construction/rehabilitation cost of the main canal /associated Structures system (i + ii) <input type="text"/> Tsh</p>	<p>Command area of the main canal <input type="text"/> ha</p> <p><input type="checkbox"/> Lined canal  <input type="checkbox"/> Unlined canal</p>	

## Form-7 Planning Sheet for Scheme Development Plan (4/10)

Sub-step 1(d) Cost Estimate of Irrigation Facilities in the Development Area			
Applicability The sub-step can be skipped for non-circled type of scheme			
1) Type of irrigation <input type="checkbox"/> Gravity <input type="checkbox"/> Pump (River) <input type="checkbox"/> (Lake/pond) <input type="checkbox"/> Rain water harvesting			
2) Type of irrigation development <input type="checkbox"/> Rehabilitation <input type="checkbox"/> Improvement <input type="checkbox"/> New Development <input type="checkbox"/> Drainage			
<b>Instruction</b>	Scheme Name	Planned Date	
<p><b>1) Obtain development area</b> Obtain development area from <b>Form-6 (a) or (b)</b>.</p> <p><b>2) Estimate construction cost of the irrigation facilities in the development area</b> Estimate the construction cost from the size of development area and unit cost.</p> <p>a) Basic cost of the irrigation facilities in the development area Development Area <input style="width: 50px;" type="text"/> ha x Unit cost <input style="width: 50px;" type="text"/> Tsh/ha = (i) <input style="width: 100px;" type="text"/> Tsh</p> <div style="border: 1px dashed black; padding: 5px; margin: 5px 0;">                     For rehabilitation scheme, obtain extent of required replacement of the secondary canals and structures from <b>Form-4 (7/7)</b>. The unit cost for a rehabilitation scheme can be estimated by multiplying the extent of required replacement (1.0(=100%), 0.5 or 0.3) by the unit cost for new development and improvement. Minor rehabilitation can be omitted.                 </div> <p>b) Contingency (10 % of (i)) (ii) <input style="width: 100px;" type="text"/> Tsh</p> <p>c) Construction/rehabilitation cost of the irrigation facilities in the development area (i + ii) <input style="width: 100px; border: 2px solid black;" type="text"/> Tsh</p>			

## Form-7 Planning Sheet for Scheme Development Plan (5/10)

Sub-step 1(e) Cost Estimate of Drainage Facilities in the Development Area			
<b>Applicability</b> The sub-step can be skipped for non-circled type of scheme			
1) Type of irrigation <input type="checkbox"/> Gravity <input type="checkbox"/> Pump (River) <input type="checkbox"/> Pump (Lake/pond) <input type="checkbox"/> Rain water harvesting			
2) Type of irrigation development <input type="checkbox"/> Rehabilitation <input type="checkbox"/> Improvement <input type="checkbox"/> New Development <input type="checkbox"/> Drainage			
<b>Instruction</b>	Scheme Name	Planned Date	
<p><b>1) Obtain development area</b> Obtain development area from <b>Form-6 (a) or (b)</b>.</p> <p><b>2) Estimate construction cost of the drainage facilities in the development area</b> Estimate construction cost from the size of the development area and unit cost.</p> <p>a) Cost of the drainage facilities in the development area Development Area <input style="width: 50px;" type="text"/> ha x Unit cost <input style="width: 50px;" type="text"/> Tsh/ha =(i) <input style="width: 100px;" type="text"/> Tsh</p> <div style="border: 1px dashed black; padding: 5px; margin: 10px 0;"> <p>For a rehabilitation scheme, obtain the extent of required replacement of the drainage canals and structures from <b>Form-4 (7/7)</b>. The unit cost for a rehabilitation scheme can be estimated by multiplying the extent of required replacement (1.0(=100%), 0.5 or 0.3) by the unit cost for new development and improvement. Minor rehabilitation can be omitted.</p> </div> <p>b) Contingency (10 % of (i)) (ii) <input style="width: 100px;" type="text"/> Tsh</p> <p>c) Construction/rehabilitation cost of the drainage facilities in the development area (i + ii) <input style="width: 100px;" type="text"/> Tsh</p>			

**Form-7 Planning Sheet for Scheme Development Plan (6/10)**

**Sub-step 1(f) Preliminary Design and Cost Estimate of Flood Dike**

**Applicability** The sub-step can be skipped for non-circled type of scheme

1) Type of irrigation  
 Gravity     Pump (River)     Pump (Lake/pond)     Rain water harvesting

2) Type of irrigation development  
 Rehabilitation     Improvement     New Development     Drainage

**Instruction**      Scheme Name      Planned Date

Stage	Condition	Duration (days)			
		1-2	3-4	5-7	more than 7
Tillering	Clean water	10%	20%	30%	35%
Booting	Muddy water	20%	45%	85%	100%
Heading	Muddy water	30%	80%	90%	100%
Ripening	Clean water	15%	25%	30%	70%
	Muddy water	5%	20%	30%	30%
	Clean water	0%	15%	20%	20%

Obtain the inundation conditions of the proposed area in the normal area from **Form-4 (2/7)**. If the water depth of inundation is a normal year is shallower than 50 cm or inundation continues shorter than seven days, skip this step and proceed to sub-step 2. If there is a risk of irrigation facilities being washed away by heavy flood, flood dike needs to be provided. The need for a flood dike can also be analyzed from **Table-6**.

**Table-6 Loss of Paddy Production due to Poor Drainage**

Note: Figures show reduction rates of paddy yield.

**2) Determine height of the flood dike if it is necessary**

Obtain the highest flood level in the past from **Form-4 (2/7)**. Determine the required height of the flood dike by adding 0.5 m allowance (freeboard) to the highest flood level.

The highest flood level  m + 0.5 m =  m (Height of the flood dike)

**3) Estimate length of the flood dike by using the scheme development plan map**

Estimate required extent of the flood dike plotting it on the scheme development map. Measure the plotted length of the flood dike.

Length of the flood dike  m

**4) Estimate construction cost for the flood dike**

Estimate the construction cost from the length of the flood dike and unit cost, which is classified according height of the dike.

a) Cost of the flood dike

Length of the dike  m x Unit cost  Tsh/m = (i)  Tsh

For a rehabilitation scheme, obtain the extent of required replacement of the flood dike from **Form-4 (7/7)**. The unit cost for a rehabilitation scheme can be estimated by multiplying the extent of required replacement (1.0(=100%), 0.5 or 0.3) by the unit cost for new development and improvement. Minor rehabilitation can be omitted.

b) Contingency (10 % of (i))

(ii)  Tsh

c) Construction/rehabilitation cost of the flood dike (i + ii)

Tsh

## Form-7 Planning Sheet for Scheme Development Plan (7/10)

Sub-step 1(g) Preliminary Design and Cost Estimate for Village Access Road			
<b>Applicability</b> The sub-step can be skipped for non-circled type of scheme			
1) Type of irrigation			
<input type="checkbox"/> Gravity	<input type="checkbox"/> Pump (River)	<input type="checkbox"/> Pump (Lake/pond)	<input type="checkbox"/> Rain water harvesting
2) Type of irrigation development			
<input type="checkbox"/> Rehabilitation	<input type="checkbox"/> Improvement	<input type="checkbox"/> New Development	<input type="checkbox"/> Drainage
<b>Instruction</b>	Scheme Name	Planned Date	
<p><b>1) Confirm route of the village access road on the present situation map</b>            Confirm the route of the village access road on the present situation map and analyze whether it connects the main road - development area - village - intake. If not, an additional road should be proposed. The additional road should be plotted on the present situation map using a different type of line.</p> <p><b>2) Measure length of the village access road</b>            Measure the length of existing and proposed village access roads on the present situation map.</p> <p><b>3) Estimate construction cost of the village access road</b>            Estimate construction cost from total length of the village access road and unit cost.</p> <p style="margin-left: 40px;">Total length <input style="width: 80px;" type="text"/> m x Unit cost <input style="width: 80px;" type="text"/> Tsh/m = <input style="width: 120px;" type="text"/> Tsh</p> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 10px;"> <div style="border: 1px dashed black; padding: 5px; width: 60%;"> <p>For a rehabilitation scheme, obtain the extent of required replacement of the village access road from <b>Form-4 (7/7)</b>. The unit cost for a rehabilitation scheme can be estimated by multiplying the extent of required replacement (1.0(=100%), 0.5 or 0.3) by the unit cost for new development and improvement. Minor rehabilitation can be omitted.</p> </div> <div style="text-align: center; width: 35%;"> <p>↑ Construction/ rehabilitation cost of village access road</p> </div> </div>			



### Form-7 Planning Sheet for Scheme Development Plan (9/10)

Sub-step 1(i) Estimation of Total Construction Cost			
Instruction	Scheme Name		Planned Date
<b>1) Estimate total construction/rehabilitation cost</b>			
Obtain the total construction cost by summing up the costs on <b>Form-7 (1/10) to (8/10)</b>			
(1a) Weir/Intake			Tsh
(1b) Pump			Tsh
(2) Main canal & associated structures			Tsh
(3) Irrigation facilities in the development area			Tsh
(4) Drainage facilities in the development area			Tsh
(5) Flood			Dike
Tsh			
(6) Village Access Road			Tsh
(7) Village Bridge/River crossing			Tsh

## Form-7 Planning Sheet for Scheme Development Plan (10/10)

Sub-step 1(j) Scheme Development Cost Estimate			
Instruction	Scheme Name		Planned Date
<b>1) Estimate scheme development cost</b>			
Obtain total construction/rehabilitation cost from <b>Form-7 (9/10)</b> and estimate the relevant costs.			
(1) Total construction cost		<input type="text"/>	Tsh
(2) Soft component cost 6.0% of (1)		<input type="text"/>	Tsh
(3) Administration cost 4.0% of (1)		<input type="text"/>	Tsh
(4) Engineering services cost 30.0% of (1)		<input type="text"/>	Tsh
(5) Operation and maintenance (O&M) cost 1.5% of (1)		<input type="text"/>	Tsh
(6) Replacement cost 2.0% of (1)		<input type="text"/>	Tsh
Scheme development Cost		<input type="text"/>	Tsh

Note:

- Soft component cost includes cost for institutional development (such as irrigators' organization establishment) and strengthening of extension service.
- Administration cost includes incremental cost of governmental administration for the scheme.
- Engineering services cost includes F/S, survey, design and construction supervision.

**Sub-step 1 Scheme Benefit Estimate**

<b>Instruction</b>	<b>Scheme Name</b>	<b>Planned Date</b>
--------------------	--------------------	---------------------

The scheme incremental benefit shall be estimated for the **development area** determined through the water balance study with and without project conditions in the following manner.

**1) Without project condition (present condition)**

**a) Estimate benefit during Rainy season**

Rainy season crop	Average Yield (kg/ha)	Average Price (Tsh/kg)	Cropped Area in Development Area (ha)	Benefit (Bro) (Tsh)
1) <input type="text"/>	<input type="text"/> x	<input type="text"/> x	<input type="text"/>	= <input type="text"/>
2) <input type="text"/>	<input type="text"/> x	<input type="text"/> x	<input type="text"/>	= <input type="text"/>
3) <input type="text"/>	<input type="text"/> x	<input type="text"/> x	<input type="text"/>	= <input type="text"/>
4) <input type="text"/>	<input type="text"/> x	<input type="text"/> x	<input type="text"/>	= <input type="text"/>
5) <input type="text"/>	<input type="text"/> x	<input type="text"/> x	<input type="text"/>	= <input type="text"/>

**b) Estimate benefit during dry season**

Dry season crop	Average Yield (kg/ha)	Average Price (Tsh/kg)	Cropped Area in Development Area (ha)	Benefit (Bdo) (Tsh)
1) <input type="text"/>	<input type="text"/> x	<input type="text"/> x	<input type="text"/>	= <input type="text"/>
2) <input type="text"/>	<input type="text"/> x	<input type="text"/> x	<input type="text"/>	= <input type="text"/>
3) <input type="text"/>	<input type="text"/> x	<input type="text"/> x	<input type="text"/>	= <input type="text"/>
4) <input type="text"/>	<input type="text"/> x	<input type="text"/> x	<input type="text"/>	= <input type="text"/>
5) <input type="text"/>	<input type="text"/> x	<input type="text"/> x	<input type="text"/>	= <input type="text"/>

**c) Estimate total benefit without project** Bro1+Bro2+Bdo1+Bdo2  (I)

Without project condition data should be derived from the survey sheet of **Form-3 (1/3)** and be calculated in the following manner.

verage Yield and Average Price for Cereals:

$$\text{Average Yield (kg/ha)} = ((\text{Max. Yield} + \text{Min. Yield}) / 2) \times \text{Weight/bag} \times 2.5$$

$$\text{Average Price (Tsh/kg)} = ((\text{Max. Price} + \text{Min. Price}) / 2) / \text{Weight/bag}$$

Average Yield and Average Price for Vegetables:

$$\text{Average Yield (kg/ha)} = ((\text{Max. Yield} + \text{Min. Yield}) / 2) \times 2.5$$

$$\text{Average Price (Tsh/kg)} = (\text{Max. Price} + \text{Min. Price}) / 2$$

Cropped Area in the Development Area:

This can be estimated from the cropped area in the proposed area shown in the present situation map by applying the percentage for each crop.

$$\text{Cropped Area in Development Area (ha)}$$

$$= \text{Percentage shown in the present situation map} \times \text{Size of Development Area}$$

**Form-8 Scheme Incremental Benefit Estimation Sheet (1/2)**

Note: Factor 2.5 indicates conversion coefficient from acre to hectare.

## Form-8 Scheme Incremental Benefit Estimation Sheet (2/2)

### 2) With project condition (after project implementation)

#### a) Estimate benefit during rainy season

Rainy season crop	Average Yield (kg/ha)	Average Price (Tsh/kg)	Development area (ha)	Benefit (Brw) (Tsh)
1) <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	= <input type="text"/>
2) <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	= <input type="text"/>
3) <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	= <input type="text"/>
4) <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	= <input type="text"/>
5) <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	= <input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

#### b) Estimate benefit during dry season

Dry season crop under irrigation	Average Yield (kg/ha)	Average Price (Tsh/kg)	Irrigable Area in Dry Season (ha)	Benefit (Bdw) (Tsh)
1) <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	= <input type="text"/>
2) <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	= <input type="text"/>
3) <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	= <input type="text"/>
4) <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	= <input type="text"/>
5) <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	= <input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
c) Estimate total benefit with project			(Brw)+(Bdw)	<input type="text"/> (II)

The project with condition data shall be elaborated by the DIDT under the careful consideration of cropping intensity. The irrigable area in the rainy and dry seasons shall be effectively utilized and the strategic crop shall be determined. Average yield shall also be estimated through various data. For example, the target yield of paddy was set as follows in the Action Plan study. Average price can basically be maintained as without project condition.

Type of Development	Present Yield (t/ha)	Target Yield (t/ha)
From rainfed condition to water harvesting or improved traditional	1.0-3.0	3.0-4.0
From traditional or poorly developed condition to improved traditional	3.0-4.5	4.5-5.5
From improved traditional or moderately developed condition to modern with full input	4.5-5.5	6.0-7.0

### 3) Obtain incremental agricultural benefit

Incremental agricultural benefit (II) - (I)

Note: In order to simplify the calculation process, the production cost was neglected for the current estimation of agricultural benefit.

# Form-9 Planning Sheet for Institutional Development Plan

Sub-step 1 Irrigators' Organization Activation/Establishment		
Instruction	Scheme Name	Planned Date
<p><b>1) Present Situation:</b>            Classify the present situation of Irrigators' Organization or other Farmers' Group from the results of the interview survey (refer to <b>Form-3 (2/3)</b>). Necessary actions for each category are shown below.</p> <p style="text-align: right;">Necessary Action</p> <p>1) <input type="checkbox"/> Both Irrigators' Organization and Farmers' Group do not exist a), b), c), d), e)</p> <p>2) <input type="checkbox"/> Farmers' Group without Registration b), c), d), e)</p> <p>3) <input type="checkbox"/> Farmers' Group registered under National Irrigation Act b), d), e)</p> <p>4) <input type="checkbox"/> Farmers' Group registered under other Act and does not comply with NIA b), d), e)</p> <p>5) <input type="checkbox"/> Irrigators' Organization without Registration b), c), d), e)</p> <p>6) <input type="checkbox"/> IO registered under other Act and does not comply with NIA d), e)</p>		
<p><b>2) Necessary Action:</b></p> <p>a) Establishment:            Any organization should be established in order to operate and maintain the irrigation facilities and this organization should be a principal actor for irrigation development.</p> <p>b) Choose type of organization (Irrigators' Organization or Farmers' Group)            An Irrigators' Organization is not a marketing or business oriented organization and its main activities are operation and maintenance of the irrigation facilities. Compulsory participation of all irrigators is a prerequisite of irrigation development.</p> <p>c) Registration:            The established organization should be registered as a legal entity to be able to access formal rights such as water rights, land tenure and public services from the government such as development assistance, technical advice, and training programs.</p> <p>d) Register under Cooperative Act or under Association Act:            Registration as a cooperative can be a lengthy procedure and, in any case, current legislation may not suit the commercial aspirations of all schemes. Registration as an Organization may result in there being certain limitations on profit-making activities and inadequate provision for audited accounts.</p> <p>e) Write a letter of undertaking to the District Council:            The commitment of the irrigators should be confirmed in writing in a signed letter of undertaking to the District Council. This should define the obligations of the irrigators' organization.</p>		
<p><b>3) Institutional Development Plan:</b></p> <p>1) Establishment : by year <input type="text"/></p> <p>2) Type of organization : <input type="checkbox"/> Irrigators' Organization Farmers' <input type="checkbox"/> Group</p> <p>3) Registration : by year <input type="text"/></p> <p>4) Law : <input type="checkbox"/> Cooperative Act <input type="checkbox"/> Association Act</p> <p>5) Letter of undertaking : by year <input type="text"/></p>		

**Indicative timeframe for institutional development**

- 1) The organization should be established immediately after the budget is confirmed.
- 2) Registration and letter of undertaking need to be made before completion of the facilities construction (Normally it takes about three years for further study, design and construction).

Sub-step 1 Confirm Irrigation Technical Plan	Scheme Name	
	Checked Date	
<b>1) Water Balance (River Discharge)</b>	<input type="checkbox"/>	<input type="checkbox"/>
a) Does obtained river discharge seem reliable?	YES	NO
(if the data is doubtful such as too much discharge in dry season, choose NO)		
<b>2) Weir and Intake</b> (Reliability of intake water level)	<input type="checkbox"/>	<input type="checkbox"/>
a) Does elevation of weir crest top seem to be higher than elevation of upstream end of the development area (can be obtained from <b>Form-4 (4/7)</b> )?	YES	NO
	<input type="checkbox"/>	NOT SURE
b) Does the intake site have a narrow, straight, moderate slope (not too gentle), stable flow and easy access point?	<input type="checkbox"/>	<input type="checkbox"/>
	YES	NO
<b>3) Main Canal and Associated Structures</b>		
a) Does the planned main canal route connect the command area of the main canal and the intake site with a gentle slope (or almost same elevation), unless there is special suitable location for weir, such as small waterfall, etc.?	<input type="checkbox"/>	<input type="checkbox"/>
	YES	NO
b) Has the length of the main canal plotted on the scheme development plan map been measured by using ruler, string or plan meter?	<input type="checkbox"/>	<input type="checkbox"/>
	YES	NO
<b>4) Flood Dike</b>		
a) Is the length of the planned flood dike enough to protect the development area from floods?	<input type="checkbox"/>	<input type="checkbox"/>
	YES	NO
b) Has the length of the flood dike plotted on the scheme development plan map been measured by using ruler, string or plan meter?	<input type="checkbox"/>	<input type="checkbox"/>
	YES	NO
<b>5) Village Access Road</b>		
a) Does the planned village access road connect the main road - village - development area - intake site?	<input type="checkbox"/>	<input type="checkbox"/>
	YES	NO
b) Has the length of the village access road plotted on the scheme development plan map been measured by ruler, string or plan meter?	<input type="checkbox"/>	<input type="checkbox"/>
	YES	NO
<b>6) Village Bridge and River Crossing</b>		
a) Is the total length of village bridges enough for crossing the river?	<input type="checkbox"/>	<input type="checkbox"/>
	YES	NO
Sub-step 2 Confirm Agricultural Information	Checked Date	
(Information on scheme benefit estimate)		
In case the result of benefit estimation is considered inappropriate, the following information should be reconfirmed.		
a) Cropped Area: With special attention to the difference in the cropped area between the rainy and dry seasons.	<input type="checkbox"/>	<input type="checkbox"/>
	YES	NO
b) Average Yield: With special attention to adjusting the unit (bag/acre to kg/ha) and proposed yield with project.	<input type="checkbox"/>	<input type="checkbox"/>
	YES	NO
c) Average Price: With special attention to obtaining the price for an ordinary year.	<input type="checkbox"/>	<input type="checkbox"/>
	YES	NO

## Form-10 Check List of the Scheme Development Plan

**Note: The item for reconfirmation is a sample only. All the data and information should be checked. If there is answer NO, the data should be reconfirmed on site. In case the data is replaced with new data, revise the survey sheet and repeat Step-6.**

# Form-11 Schemes Prioritization Sheet

Only one Form-11 should be completed per district

Name of the District: \_\_\_\_\_

Indicators	Criteria for Ranking
<b>Adequacy</b>	a) Technical adequacy i) Reliability of intake water level (see <b>Form-10</b> ), ii) availability of construction material, iii) availability of construction company b) Social adequacy i) villagers consensus, ii) farmers motivation c) d) e)
<b>Efficiency</b>	a) EIRR (Economic Internal Rate of Return), etc. b) c)
<b>Dependability</b>	a) Performance of irrigators' Organization, b) Performance of farmers on group activities, etc. c) d)
<b>Equity</b>	a) Even distribution of land in the development area, b) No water conflicts between adjacent villages (over water rights), etc. c) d)

Enter 1 for the first ranked scheme, enter 2 for the second,



Name of the Scheme Selected	Ranking				Final Ranking
	Adequacy	Efficiency	Dependability	Equity	
		(EIRR__%)			

### Box

#### Meaning of Adequacy, Efficiency, Dependability and Equity

- 1) "Adequacy" means workability of the development plan or readiness for implementation. If the scheme is ready for implementation, "adequacy" is high.
- 2) "Efficiency" means rate of investment and return. High return with low investment represents high "efficiency".
- 3) "Dependability" means sustainability of the scheme. If farmers' performance in the scheme area is high, "dependability" is also high.
- 4) "Equity" means even distribution of public properties. An even distribution of land in the scheme area indicates high "equity"



## Form-12 Scheme Digest (Summary of Preliminary Planning for ISD) (2/2)

### 3.2 Agriculture Development Plan

- (1) Dry season : Cropped area \_\_\_\_\_ ha  Paddy  Maize  Vegetable
- (2) Rainy season : Cropped area \_\_\_\_\_  ha  Paddy  Maize  
Vegetable
- (3) Annual incremental annual agricultural benefit: \_\_\_\_\_ Tsh.

### 3.3 Institutional Development Plan

- (1) Establishment : by year \_\_\_\_\_
- (2) Type of organization :  Irrigators' Organization  Farmers' Group
- (3) Registration : by year \_\_\_\_\_
- (4) Law :  Association Act  Cooperative Act
- (5) Letter of undertaking : by year \_\_\_\_\_

### 3.4 Environment

- Water conflict within the scheme/village  Water conflict with other scheme/village
- Land conflict  Effect on protected area  Soil erosion in the scheme
- Cause of conflict ( \_\_\_\_\_ )
- EIA :  Required  Preliminary assessment is required  Not required
- Location :  Within protected area  Outside of protected area

### 3.5 Scheme development Cost

- (1) Construction/Rehabilitation \_\_\_\_\_ :  
Tsh.
- (2) Soft component : \_\_\_\_\_ Tsh
- (3) Administration \_\_\_\_\_ :  
Tsh.
- (4) Engineering \_\_\_\_\_ :  
Tsh.
- (5) O&M \_\_\_\_\_ :  
Tsh.
- (6) Replacement \_\_\_\_\_ :  
Tsh.
- TOTAL \_\_\_\_\_ :  
Tsh.

**Note:** Scheme development plan map should be attached.

## Form-13 District Supporting Programme Digest

<b>1) Title of the District Supporting Programme</b>		Planned Date	
<b>2) Target Group (Who will benefit from the plan?)</b>			
<b>3) Goal of the Programme (should be only one)</b>			
(What is the outcome of the plan?)		(By when shall it be achieved?)	



<b>4) Activities (Required activities to achieve the goal of the programme)</b>		
(Activities)	(Who will take action?)	(Time Schedule)
a)		
b)		
c)		



<b>5) Inputs (Required inputs to conduct the activities)</b>			
(Activities)	(Required Manpower)	(Required Equipment)	(Cost)
a)			
b)			
c)			
3-40			

(Total)

Note: This sheet is applicable to present the plan for one programme.

## Form-14 Summary of Irrigation Scheme Formulation Plan

Irrigation Scheme Formulation Plan for ISD		for Fiscal Year	
Name of District		Planned Date	
<b>1) Scheme Development Plan</b>			
Name of the scheme _____			
<b>1. Overall Scheme Development Cost</b> (can be obtained from Form-12)			
(1) Construction/Rehabilitation	:	_____ Tsh.	
(2) Soft component	:	_____ Tsh.	
(3) Administration	:	_____ Tsh.	
(4) Engineering	:	_____ Tsh.	
(5) O&M	:	_____ Tsh.	
(6) Replacement	:	_____ Tsh.	
<b>2. Initial Investment Cost</b>			
(a) Investment cost	:	_____ Tsh. Total of (1) to (4) of 1.	
(b) Farmers' contribution	:	_____ Tsh. Standard is 20% of 1. (1)	
(c) District Council	:	_____ Tsh. (a) - (b)	
<b>3. Phase-wise Development Plan</b> (should be finalized after Step-12)			
(if there is no phase-wise development, enter all the initial investment cost (c) into Phase-1)			
Phase-1	:	_____ Tsh. in fiscal year _____	
Phase-2	:	_____ Tsh. in fiscal year _____	
Phase-3	:	_____ Tsh. in fiscal year _____	
Phase-4	:	_____ Tsh. in fiscal year _____	
<b>2) Scheme Formulation Planning Cost for Next ISD</b>			
Required cost for scheme formulation planning for next ISD		:	_____ Tsh.
This cost shall be separated from Irrigation Scheme Formulation for ISD			
<b>3) District Supporting Programme</b>			
Title and cost of the plan (use additional sheet if there are more than three plans)			
(a)	:	_____ Tsh.	
(b)	:	_____ Tsh.	
(c)	:	_____ Tsh.	
TOTAL	:	_____ Tsh.	

## Form -15 MONITORING SHEET FOR FORMULATION

Date Filled Out: \_\_\_\_\_

Q1-1 Has "Quick Site Inspection and Screening Report" been submitted from LGA to ZIO?

Yes (Date: \_\_\_\_\_ )  Not yet

Q1-2 Has the Zonal Review Committee been appointed and introduced officially from ZIO to NIRC?

Yes (Date: \_\_\_\_\_ )  Not yet

Q1-3 Was the "Confirmation letter on the proposed development area has been submitted from IO to LGA?

Yes (Date: \_\_\_\_\_ )  Not yet

Q1-4 Were Scheme Development Plan Map drawn by LGA staff and IO members?

Yes (Date: \_\_\_\_\_ )  No

Q1-5 Was the contents of a District's supporting program for IO agreed by both LGA and IO?

Yes (Date: \_\_\_\_\_ )  No

Q1-6 Did LGA prepare fund request letter/forms?

Yes (Date: \_\_\_\_\_ )  No

Q1-7 Did LGA and IO agree a cost-sharing plan (i.e. farmers' 20% contribution and LGA/NIRC/DPs 80% share) in a written form?

Yes (Date: \_\_\_\_\_ )  No

Q1-8 Did all stakeholders agree to the formulation plan in a written form?

Yes (Date: \_\_\_\_\_ )  No

Q1-9 Was "Irrigation Scheme Formulation Plan Report" submitted from LGA to ZIO?

Yes (Date: \_\_\_\_\_ )  No

Q1-10 Was "Validation and agreement letter, and Review Paper submitted from ZIO to LGA?

Yes (Date: \_\_\_\_\_ )  No

Q1-11 Has a scheme implementation schedule of LGA been shared with ZIO?

Yes

Not yet

Q1-12 Remarks, if any

# **SECTION 4 TECHNICAL GUIDANCE**

# Supplementary Explanations

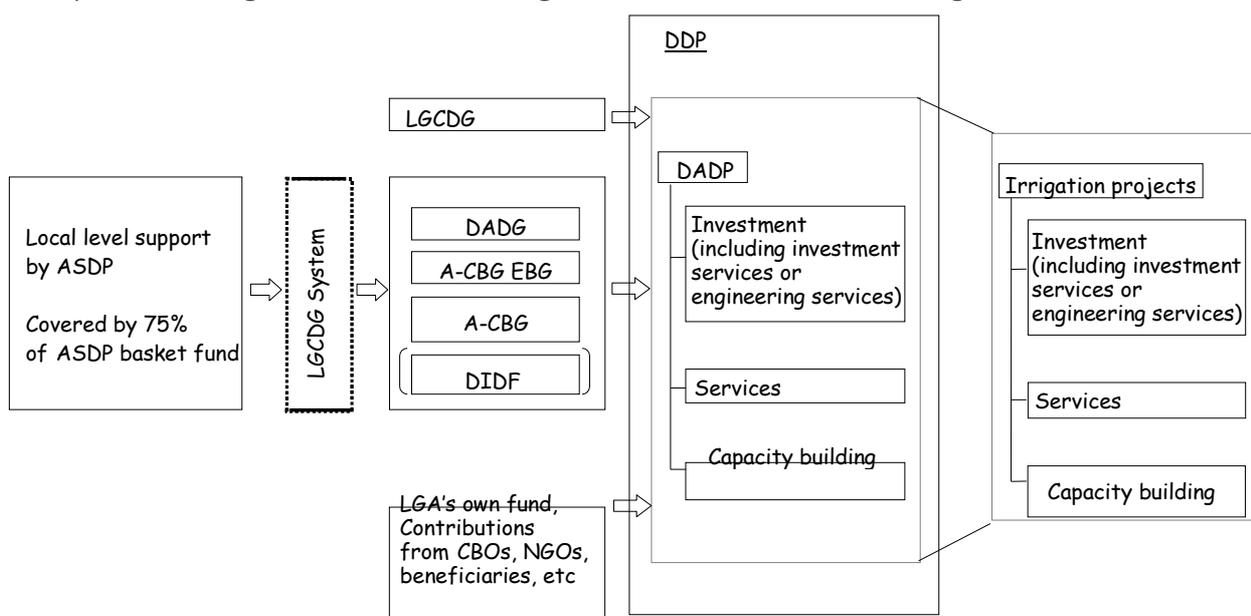
## 1. Organization of DIDT and Support from ZIO/RIO Staff

The district is supposed to organize the DIDT (or District Irrigation Development Team) for the irrigation scheme formulation activities in accordance with this Guidelines. In order to harmonize this DIDT with DFT (or District Facilitation Team) stipulated in ISD Guidelines, DIDT is considered as sub-set of DFT. DFT will decide DIDT members from DFT members or other persons with technical experience in irrigation agriculture.

Zonal staff can be a member of DIDT in the first trial of the district's formulation activities, fully involved in the DIDT's activities. From the second trial, zonal staff assists the district upon request from the district. Zonal staff's involvement and assistance shall be covered by central government budget through Nation Irrigation Commission (NIRC).

## 2. Operation of ISD Financing System

The figure below shows the relationship between the financing system for ISD, part of DDP, and the ISD Guidelines. The Comprehensive Guidelines for Irrigation Scheme Development will be positioned in the appendix of ANNEX 1, which stipulates the guidelines for local agricultural investment utilizing DADG fund, of the



**Relationship between financing system for DADP and DADP Guidelines**

- DADP Guidelines (November 2006):
- Annex 1: Local Agricultural Investment
  - Annex 2: Local Agricultural Services
  - Annex 3: Local Agricultural Capacity Building and Reform

4-1

Appendix:  
Comprehensive Guidelines for  
Irrigation Scheme Development

ISD Guidelines. Also, the ISD irrigation scheme formulation will be implemented based on the funding framework stipulated in the ISD Guidelines. As shown in the figure on the previous page, the ISD will be covered by several sources of funds: LGCDG, ASDP basket fund allocated through LGCDG system, and others. The ISD Guidelines has three annexes, corresponding to three sub-components of the ASDP local level support: 1) local agricultural investment, 2) local agricultural services, and 3) local agricultural capacity building and reform. The funding sources through ASDP basket fund have three types of grant, DADG, EBG and A-CBG, corresponding to the sub-components of the ASDP local level support.

In a similar way, **ISD (DADP)** have three components of investment, services and capacity building, which correspond to three types of grant for **ISD**, namely, DADG, EBG and A-CBG. Also, the irrigation scheme development, which is part of **ISD (DADP)**, has similar components.

The following funding sources of grant for **ISD** are available for the irrigation scheme development, including formulation activities, the district supporting programmes, etc.

- For investment, which means construction work DADG basic or enhanced
- For irrigation scheme formulation activities, which are considered to be part of investment services (or engineering services) DADG basic
- For investment services (or engineering services), including feasibility study, EIA, detailed design, tender documentation, tendering and construction supervision DADG basic or enhanced
- For district supporting programmes, including purchase of office equipment and vehicles, capacity building for district staff, extension officers and farmers A-CBG basic or enhanced

### 3. Timeframe of Formulation Activities

The Activities of irrigation scheme formulation in accordance with these Guidelines are what the district takes initiative in implementing. Therefore, the district is required to secure budget and personnel for the formulation activities. In addition, the district should proceed with the activities as efficiently as possible because of the limitation of time and budget.

The figures below show a standard schedule of the activities. It takes 5 or 6 weeks for planning of one scheme and 8 weeks for planning of two schemes.

(1) In case one scheme is selected by quick site inspection and screening

Ste	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Quick site inspection and screening (Step-1 to Step-4)	■					
Field survey (Step-5)		■	■			
Preliminary planning (Step-6)				■		
District supporting programme designing (Step-7 to Step-8)				■		
Irrigation scheme formulation planning (Step-9 to Step-12)					■	■

(2) In case two schemes are selected by quick site inspection and screening

Step	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Quick site inspection and screening (Step-1 to Step-4) field survey (step-5)	■					
for Scheme I Field survey (Step-5) for Scheme II		■	■			
Preliminary planning (Step-6) for Scheme I Preliminary planning (Step-6) for Scheme II				■		
District supporting programme designing (Step-7 to Step-8)				■		
Irrigation scheme formulation planning (Step-9 to Step-12)					■	■

Note for above schedule (1) and schedule (2):

- 1) The district should consider conducting quick site inspection by dividing DIDT into several small teams.
- 2) Field survey (Step-5) includes preparatory works and office work of present situation mapping.
- 3) Step-12 includes submission of the plan to CMT and ZIO/RIO, evaluation of the plan by CMT, and finalization of the plan in accordance with the comments from CMT.

#### **4. Overall Scheme Formulation Schedule**

According to "ISD Guidelines," Head of department dealing with irrigation and DPLO are supposed to prepare **ISD** in January to February in each financial year after the receipt of village plans and ward plans formulated through O&OD practices.

However, the formulation activities for schemes, where quick site inspection was already done in the previous years, can be done in October to December. For these schemes, it may be possible to proceed with the formulation activities in parallel with the village and ward planning through O&OD practices which are supposed to take place again. In this case, the formulation activities may start with Step-2 (quick site inspection) again and Step-3 (screening) again because the situation of target villages may change in a year's time.

On the other hand, the formulation activities for schemes where quick site inspection has not been done yet should be done in January to February, after the receipt of VDPs and WDPs, in accordance with the normal procedures stipulated in the **ISD Guidelines**.

In this way, we have a possibility of proceeding with irrigation scheme formulation activities efficiently.

A recommended schedule of overall scheme formulation planning

Activities	OCT	NOV	DEC	JAN	FEB	MAR
<p>Planning for schemes where quick site inspection was already done in previous years</p> <p>- Able to be done in parallel with O&amp;OD practices</p>		<p>Step-2 to Step-11</p>				
<p>Planning for schemes where quick site inspection has not been done yet</p> <p>- To be done after receipt of VDPs and WDPs</p>		<p>Receipt of VDPs &amp; WDPs</p> <p>O&amp;OD practices</p>		<p>Step-1 to Step-11</p>		
<p>Prioritization of schemes (part of Step-6), district supporting programme designing (Step-7 and Step-8), and finalisation of overall plan of irrigation schemes for ISD (Step-12)</p>						

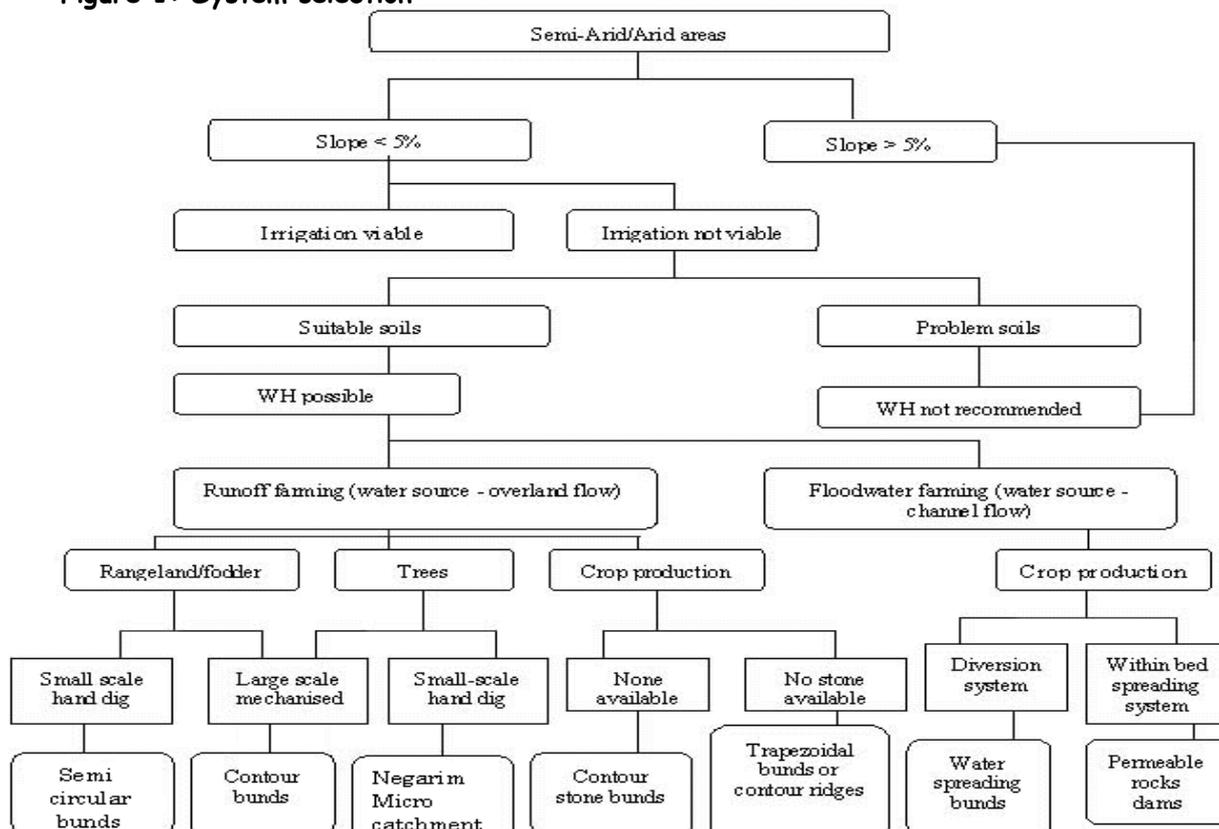
## 5. Rain Water Harvesting

Rainwater harvesting is defined as a method for inducing, collecting, storing and conserving local surface runoff for agriculture in arid and semi-arid regions (Boers and Ben-Asher, 1982).

Before selecting a specific technique, due consideration must be given to the social and cultural aspects prevailing in the area of concern as they are paramount and will affect the success or failure of the technique implemented. This is particularly important in the arid and semi-arid regions of Africa and may help to explain the failure of so many projects that did not take into account the people's priorities. In arid and semi-arid Africa, most of the population has experienced basic subsistence regimes which resulted over the centuries in setting priorities for survival. Until all higher priorities have been satisfied, no lower priority activities can be effectively undertaken.

In addition to the socio-economic considerations, a water harvesting scheme will be sustainable if it also fulfils a number of basic technical criteria as shown in Figure 1. The chart shows the basic technical selection criteria for the different water harvesting techniques.

**Figure 1: System selection**

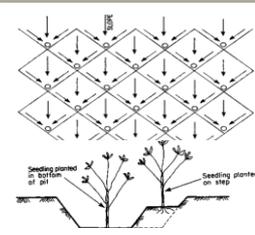
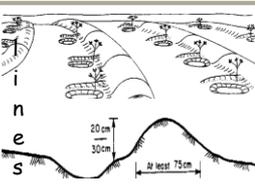
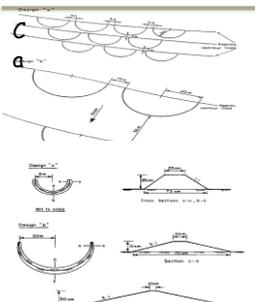


**SLOPE:** The ground slope is a key limiting factor to water harvesting. Water harvesting is not recommended for areas where slopes are greater than 5% due to uneven distribution of run-off and large quantities of earthwork required which is not economical.

**SOILS:** Should have the main attributes of soils, which are suitable for irrigation: they should be deep, not be saline or sodic and ideally possess inherent fertility. A serious limitation for the application of water harvesting is soils with a sandy texture. If the infiltration rate is higher than the rainfall intensity, no runoff will occur.

**COSTS:** The quantity of earth/stonework involved in construction directly affects the cost of a scheme or, if it is implemented on a self-help basis, indicates how labor intensive its construction will be.

An overview of the main Water Harvesting systems is given in Table 1. This summary will be useful as a quick reference. The eight techniques presented and explained in the manual are not the only water harvesting systems known but they do represent the major range of techniques for different situations and productive uses. In a number of cases, the system which is described here is the most typical example of a technique for which a number of variations exist - trapezoidal bunds are a case in point.

Table	1	-	Summary	chart	of	main	WH	techniques
	Classification	Main Uses	Description	Where Appropriate	Limitations			
Negarim micro catchments	Micro catchment (short slope catchment) technique	Trees & grass	Closed grid of diamond shapes or open-ended "V" s formed by small earth ridges, with infiltration pits	For tree planting in situations where land is uneven or only a few tree are planted	Not easily mechanised therefore limited to small scale. Not easy to cultivate between tree			
Contour bunds	Micro catchment (short slope catchment) technique	Trees & grass	Earth bunds on contour spaced at 5-10 metres apart with furrow upslope and cross-ties	For tree planting on a large scale especially when mechanised	Not suitable for uneven terrain			
Semi circular bunds	Micro catchment (short slope catchment) technique	Rangeland & fodder (also trees)	Semi-circular shaped earth bunds with tips on contour. In a series with bunds in staggered formation	Useful for grass reseeding, fodder or tree planting in degraded rangeland	not be mechanised therefore limited to areas with available hand labour			

Contour ridges	Micro catchment (short slope catchment) technique	Crops	Small earth ridges on contour at 1.5m-5m apart with furrow upslope and cross-ties Uncultivated catchment between ridges	For crop production in semi-arid areas especially where soil fertile and easy to work	Requires new technique of land preparation and planting, therefore may be problem with acceptance	
Trapezoidal bunds	External catchment (long slope catchment) technique	Crops	Trapezoidal shaped earth bunds capturing runoff from external catchment and overflowing around wingtips	Widely suitable (in a variety of designs) for crop production in arid and semi-arid areas	Labour-intensive and uneven depth of runoff within plot.	
Contour stone bunds	External catchment (long slope catchment) technique	Crops	Small stone bunds constructed on the contour at spacing of 15-35 metres apart slowing and filtering runoff	Versatile system for crop production in a wide variety of situations. Easily constructed by resource-poor farmers	Only possible where abundant loose stone available	
Permeable rock dams	Floodwater farming technique	Crops	Long low rock dams across valleys slowing and spreading floodwater as well as healing gullies	Suitable for situation where gently sloping valleys are becoming gullies and better water spreading is required	Very site-specific and needs considerable stone as well as provision of transport	
Water spreading bunds	Floodwater farming technique	Crops & rangeland	Earth bunds set at a gradient, with a "dogleg" shape, spreading diverted floodwater	For arid areas where water is diverted from watercourse onto crop or fodder block	Does not impound much water and maintenance high in early stages after construction	

References:

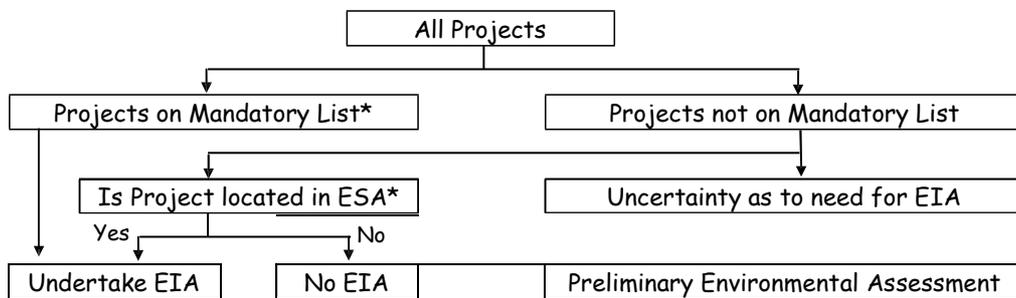
"Water Harvesting (AGL/MISC/17/91)" by FAO, 1991

"Rainwater harvesting technology for agricultural production: A case for Dodoma, Tanzania" by N.Hatibu and H. Mahoo

"Rainwater harvesting Design manual for Irrigation Agriculture in Marginal Areas" by MAFS, 2001

## 6. Environmental Consideration

As shown in the screening procedure below, environmental impacts through the development of irrigation schemes shall be considered in all irrigation interventions at the stage of the feasibility study. Depending on the nature of the project in some cases an EIA will be undertaken before the preliminary environmental assessment is conducted, where as in other cases preliminary environmental assessment shall be conducted to find whether an EIA is necessary or not. Where not essary appropriate mitigation measures will be identified and incorporated in the design. The cost for EIA shall be 4% in accordance with a National Standard, and this cost shall be included in the scheme development cost.



Note: Mandatory List (Agriculture)

- Large scale cultivation,
- Water resources development projects (dams, water supply, flood control, irrigation, drainage),
- Large scale mono-culture (cash and food crops including floriculture),
- Biological Pest Control,
- Agricultural projects necessitating the resettlement of communities,
- Introduction of new breeds of crops,
- Introduction of Genetically Modified Organisms (GMOs).

Note: ESA (Environmentally Sensitive Areas)

- Areas prone to natural disasters,
- Wetlands,
- Mangrove swamps,
- Areas susceptible to erosion,
- Areas of importance to threatened cultural groups,
- Areas with rare/endangered/or threatened plants and animals,

- Areas of unique socio-cultural, archaeological or scientific significance and areas with potential tourist value,
- Polluted area,
- Area subject to desertification and bush fires,
- Coastal areas/Marine ecosystems,
- Areas declared as national park, watershed reserve, forest reserve, game reserve, wildlife corridors,
- Mountainous areas, water catchment areas and recharge areas of aquifers,
- Areas classified as prime agricultural lands or range lands,
- Green belts or public open spaces in urban area, - Burial sites and graves.

The registration form for EIA is attached in the followed pages.

**NATIONAL ENVIRONMENTAL MANAGEMENT COUNCIL  
ENVIRONMENTAL ASSESSMENT PRELIMINARY  
REGISTRATION FORM**

Fee.....

Serial No.....

**FORM EA**

**PROPONENT:**

.....

Address for correspondence

.....

.....

.....

Contact person .....Position.....

Phone.....Fax No.....

**ASSESSMENT NO:**.....

**FILE NO:**.....

National Environmental Management Council

P.O.Box 63154,

DAR-ES-SALAAM-TANZANIA.

Tel:2127817/2134603 or 0713-

608930. Fax 2111579.

## **GUIDE FOR COMPLETING AN ENVIRONMENTAL ASSESSMENT REGISTRATION FORM.**

The environmental Assessment Registration form is designed to provide enough relevant information to enable **NEMC** to set an appropriate level of assessment for a proposal referred to it. Failure to provide information in a comprehensive manner may delay the assessment process.

It is not expected that this form will be appropriate for all purposes and, depending on the nature of the proposal, a lengthy document may be necessary in addition to this form.

### **PROPOSAL**

A simple, brief description of the proposal or proposed undertaking is required and must include: quantities of raw material required; input processes, end results, output quantities and timing.

Please include flow diagram if available.

### **LOCATION**

A map/site plan is essential.

It should indicate the geographic co-ordinates of the site elevation and slope, any nearby area of environmental significance (e.g. proposed or declared reserves, water courses, wetlands) and adjacent land uses, including the nearest homes or areas zones residential.

### **SERVICES**

Details of water supply, storm water drainage, power corridors, access to and impact on roads and transport can all be the significance and should be noted where relevant.

### **ENVIRONMENTAL IMPACT**

Criteria for assessing a project and setting a level of assessment are:

1. The character of the receiving environment.
2. The potential impact of the proposal and confidence of the predicting impacts.
3. Resilience of the environmental to cope with change.
4. The technology to be used.
5. Plans, policies or procedure, which influence land use changes.

6. Degree of the public interest (i.e. concerns of the general public)

7. Any other relevant factors to the particular undertaking.

The following potential environmental impacts may be relevant;

- Effects on geomorphology, land stability and landscape.
- Effects on drainage and water quality (surface and ground)
- Effects on biota.
- Effects on access and transport system
- Effects on existing services including power, water and telephone.
- Effects on existing community facilities
- Effects on existing contingency plans for safety and emergency services.
- Effects of emissions (gas, dust, noise and heat)
- Management of solid and liquid waste and storm water.
- Impact on adjacent land uses including any conservation and recreation aspects
- Impact of construction and operational activities
- Visual impact
- Social impact

**1. PROPOSED UNDERTAKING /DEVELOPMENT**

Title of proposal (general classification of undertaking)

.....

Description of proposal (nature of undertaking, unit processes [flow diagram], raw materials list of chemicals {source, types and quantities}, storage facilities, wastes/by-products {solid, liquid and gaseous}.

.....  
.....  
.....  
.....  
.....  
.....  
.....

Scope of proposal (size of labour force, equipment and machinery, installed/production capacity, product type, area covered facility/proposal, market)

.....  
.....  
.....  
.....

**2. PROPOSED SITE**

Location (attach a site plan/map)

.....

Current zoning

.....

Distance to nearest residential and/ or other facilities

.....

Adjacent land uses (existing & proposed)

.....

Site description

.....  
.....  
.....

**3. INFRASTRUCTURE AND UTILITIES**

Structures (building and other facilities)

.....

Land required

.....  
.....

Water (source, quantity)

.....  
.....

Power (type, source & quantity)

.....  
.....

Road

.....  
.....

Other utilities (e.g. sewerage, etc)

.....  
.....

**4. ENVIRONMENTAL IMPACTS**

Potential environmental effects of proposed undertaking (both construction and operation phases).

.....  
.....

**5. OTHER ENVIRONMENTAL ISSUES**

Potential significant risks and hazards associated with the proposal (including occupational health and safety). State briefly relevant environmental studies already done and attach copies as appropriate.

.....  
.....  
.....  
.....  
.....

**6. MITIGATION OF IMPACT AND ENVIRONMENTAL ENHANCEMENT MEASURES.**

.....  
.....  
.....  
.....  
.....

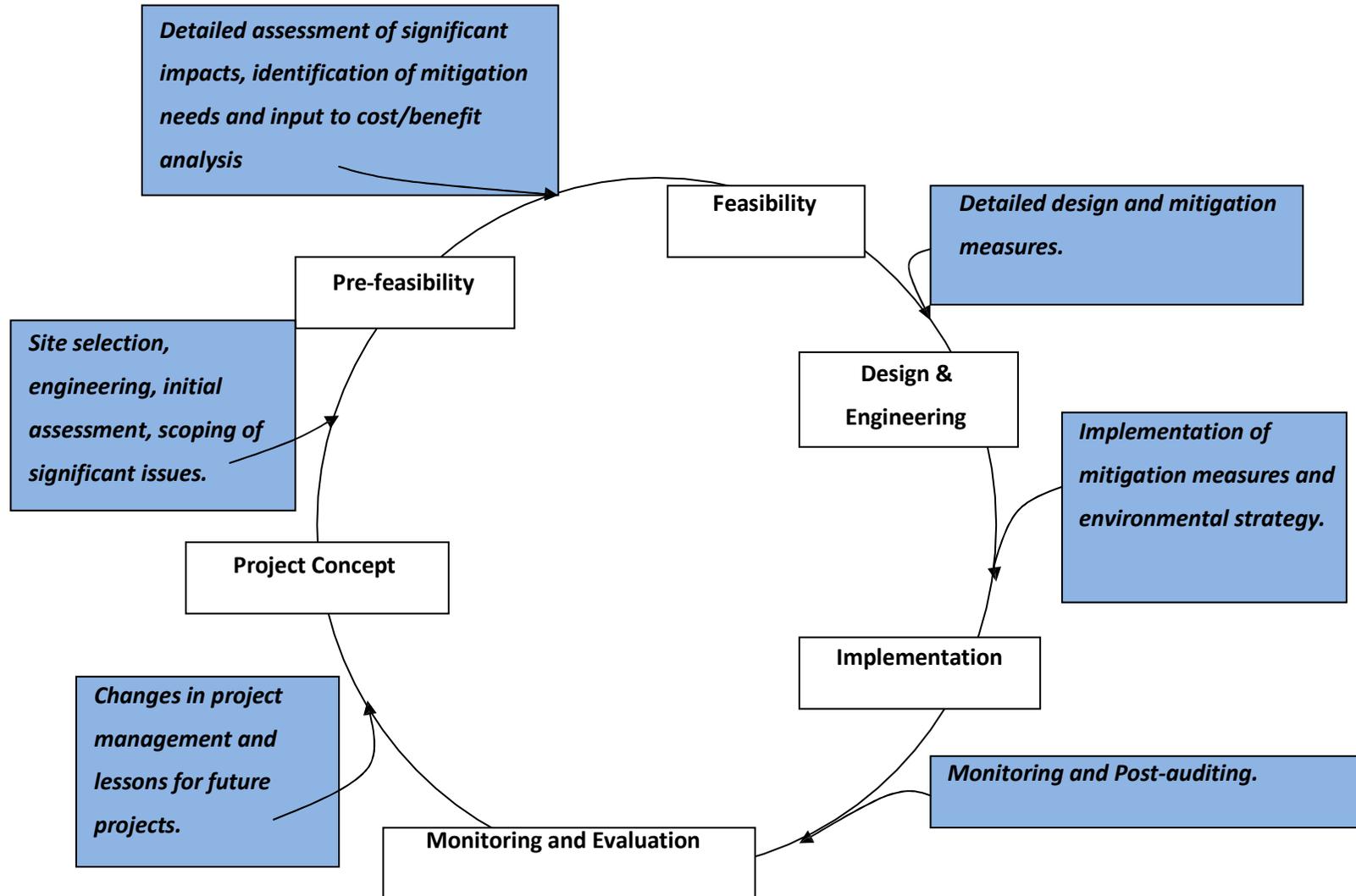
**DECLARATION:**

I,.....hereby declare that the information provided on this form is true to the best of my knowledge and shall provide any additional information that shall come to my notice in the course of processing this application.

.....

..... Signature  
Date

# EIA IN THE PROJECT CYCLE



## **7. Engineering Services Cost (or Investment Services Cost)**

The **ISD** Guidelines stipulate that the engineering services cost (or investment services cost), which covers F/S, D/D, supervision and other services associated with the investment, is 15% of total DADG. However, in the case of irrigation projects, an appropriate ratio of the engineering services cost to the total construction cost is 30% because the detailed F/S and the EIA are required for irrigation projects. Irrigation projects are considered to be exceptional cases.

## **8. Reporting Formats**

The reporting formats for "Quick Site Inspection and Screening Report" and "Irrigation Scheme Formulation Plan Report" to be prepared by the districts are attached in the following pages.

# Sample Format of Quick Site Inspection and Screening Report

Date: \_\_\_\_\_

Prepared by District Irrigation Development Team (DIDT),  
District Council

## Table of contents

	Page
1. Background .....	
2. Purpose and schedule of the work .....	
3. Results of quick site inspection .....	
4. Screening and scoring criteria .....	
5. Results of screening and conclusion .....	
Attachment: Form-1 List of irrigation schemes for quick site inspection	
Form-2 Survey sheet for quick site inspection	
Scoring sheet for screening	

---

### 1. Background

Summarize the situation of existing irrigation schemes in the district, the potentials of irrigation development, and the future direction of irrigation development in the district.

### 2. Purpose and schedule of the work

Describe the purpose of the quick site inspection and screening work, the list of selected irrigation schemes/villages surveyed, the reason for the selection of schemes surveyed, DIDT members who have participated in the work, and its schedule.

#### List of irrigation schemes/villages surveyed

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

(See Form-1 attached hereto.)

### Schedule of quick site inspection and screening work

Work	Date of start Day/Month/Year	Date of completion Day/Month/Year	Persons who participated in the work
Quick site inspection for (name of scheme)			
Quick site inspection for (name of scheme)			
Quick site inspection for (name of scheme)			
Quick site inspection for (name of scheme)			
Quick site inspection for (name of scheme)			
Quick site inspection for (name of scheme)			
Quick site inspection for (name of scheme)			
Screening work			
Compilation of report by DIDT			
Review of report by ZRC			

### **3. Results of quick site inspection**

See Form-2 attached hereto.

### **4. Screening and scoring criteria**

Explain the flow of screening and reasons for selection and prioritization of the screening and scoring criteria.

#### Selected criteria for screening

Criteria	Point allocation (Maximum point)	Score of each category
(1) Technical assessment		
(a) Water resources	15	
Perennial river		15
Dam		10
Others		5
(b) Potential area	10	

Criteria	Point allocation (Maximum point)	Score of each category
Less than 500 ha		10
Between 500 to 2000ha		7
More than 2000 ha		5
(c) Irrigation type	15	
Gravity		15
Rain water harvesting		10
Pump		5
(2) Farmers' Motivation	30	
High		30
Medium		20
Low		10
(3) Social and economic assessment		
(a) Marketing	10	
Linked with market/traders		10
Not linked with market/traders		5
(b) Scheme access road	10	
Good enough		10
Not good enough		5
(c) Anticipated conflict due to land, water, etc	10	
Anticipated		10
Not anticipated		5
Total	100	

## 5. Results of screening and conclusion

Summarize the results of the screening work, its conclusion, and the reason for reaching the conclusion, including particular circumstances of each scheme.

### Summary of scoring results

Rank	Name of scheme	Score	Remarks
1			Selected or not selected
2			Selected or not selected
3			Selected or not selected
4			Selected or not selected
5			Selected or not selected
6			Selected or not selected
7			Selected or not selected
8			Selected or not selected
9			Selected or not selected
10			Selected or not selected

# Sample Format of Irrigation Scheme Formulation Plan Report

Date: \_\_\_\_\_

Prepared by District Irrigation Development Team (DIDT).

District Council

<b>Table of contents</b>	<b>Page</b>
1. Introduction .....	
2. Present conditions of target irrigation scheme .....	
2-1 Location and geography .....	
2-2 Cultivation and market .....	
2-3 Existing irrigation system .....	
2-4 Existing institution .....	
3. Basic plan .....	
3-1 Development area .....	
3-2 Agricultural development plan .....	
3-3 Water source and irrigation type .....	
3-4 Water balance study .....	
4. Preliminary facility planning .....	
5. Summary of cost estimate .....	
6. Institutional development plan .....	
7. Environmental consideration .....	
8. Scheme evaluation .....	
9. District supporting programmes .....	
10. Implementation plan .....	
Attachment: Quick site inspection and screening report with Form-1 and Form-2 attached	
Scheme development plan map	
Form-3 Survey sheet for Interview survey with stakeholders	
Form-4 Survey sheet for field condition confirmation	
Form-5 Calculation sheet for irrigation water requirement	
Form-6 Calculation sheet for water balance study	
Form-7 Planning sheet for scheme development plan	
Form-8 Scheme incremental benefit estimation sheet	
Form-9 Planning sheet for institutional development plan	
Form-10 Check list of the scheme development plan	
Form-11 Schemes prioritization sheet	
Form-12 Scheme digest (Summary of preliminary planning for <b>ISD</b> )	

In "Attachment," attach all the forms and the scheme development plan maps for all the schemes surveyed and studied.

- Form-13 District supporting programme digest  
 Form-14 Summary of irrigation scheme formulation plan  
 Form-15 Monitoring Sheet for Step 1-12

## 1. Introduction

Describe DIDT members who have participated in the scheme formulation activities in accordance with the guidelines.

The formulation activities have been implemented in accordance with the schedule shown in the table below:

### Summary of the scheme formulation activities

Step	Date of start Day/Month/Year	Date of completion Day/Month/Year	Remarks
<u>Step-1 to Step-4</u> Quick site inspection and screening			"Quick site inspection and screening report" compiled by DIDT on Day/Month/Year, and reviewed by ZRC on Day/Month/Year
<u>Step-5 to Step-6</u> Survey, study and planning			Name of scheme, name of scheme, ... surveyed, studied, planned and prioritized
<u>Step-7 to Step-10</u> Compilation and review			"Irrigation scheme formulation plan report" compiled by DIDT on Day/Month/Year, and reviewed by ZRC on Day/Month/Year
<u>Step-11</u> Feedback workshop			

In the quick site inspection and the screening work, (number of schemes) scheme(s) was (were) selected for further study from (number of schemes) schemes where irrigation activities were given first priority in O&OD practices. (See "Quick site inspection and screening report" attached hereto)

In the subsequent steps, the selected scheme(s) has (have) been surveyed and studied, and (name of scheme), (name of scheme), has (have) been finally selected as candidate(s) for **ISD** to be commenced in the next financial year. As a result, the scheme formulation plan has been prepared for this (these) scheme(s).

### Schemes surveyed and studied

Name of scheme	Ward	Village	Remarks
			Selected as candidate

## Supplementary Explanations

Name of scheme	Ward	Village	Remarks

In "2. Present conditions of target irrigation scheme," describe only the scheme(s) finally selected for **ISD**.

Do not describe all the schemes surveyed and studied.

### 2. Present conditions of the target irrigation scheme

#### 2-2 Location and geography

Describe the location - UTM coordinates, distance from town or village, distance from main road, etc, and the geographical features of the target irrigation scheme site.

#### 2 - 2 Cultivation and market

Describe the situation of cultivation, using the table below, and the situation of the market - distance from site, type of market (middleman, local market or town market), etc.

##### Present situation of cultivation-(Name of scheme)

Season	Crop	Month of land preparation	Month of harvest	Present irrigated area (ha)	Present rain-fed area (ha)
Rainy season					
Dry season					

##### Present situation of cultivation-(Name of scheme)

Season	Crop	Month of land preparation	Month of harvest	Present irrigated area (ha)	Present rain-fed area (ha)
Rainy season					
Dry season					

#### 2-3 Existing irrigation system

Describe the situation of the existing irrigation system, if any - type of irrigation (gravity or pump, traditional or modern or rain water harvesting), water source, present irrigated area, etc.

## 2 - 4 Existing institution

Describe the situation of the existing institution - already established or not established yet, registered or not under National Irrigation Act or any other Act, name of institution, year of establishment, year of registration, water right granted or not, etc.

## 3. Basic plan

In "3. Basic plan," describe only the scheme(s) finally selected for **ISD**. Do not describe all the schemes surveyed and studied.

### 3-1 Development area

The development area for the selected irrigation scheme has been decided as shown below:

<u>Development area</u>		
	(Name of scheme)	(Name of scheme)
Potential area	ha	ha
Proposed area	ha	ha
Surveyed area	ha	ha
Irrigable area	ha	ha
Development area	ha	ha

(See "Scheme development plan map" attached hereto.)

Describe the reason for deciding the above development area, referring to the results of the field survey (Step-5) and the preliminary planning (Step-6).

### 3-2 Agricultural development plan

Describe the agricultural development plan, using the table below, and its reason, referring to the present crop production, the farmers' intention and the results of the water balance study.

#### Agricultural development plan-(Name of scheme)

Season	Crop	Month of land preparation	Month of harvest	Planned irrigated area (ha)
Rainy season				
Dry season				

Agricultural development plan-(Name of scheme)

Season	Crop	Month of land preparation	Month of harvest	Planned irrigated area (ha)
Rainy season				
Dry season				

**3-3 Water source and irrigation type**

Describe the situation of water source, the proposed location of the intake, and the type of irrigation (gravity or pump or rain water harvesting). Also, describe the reason for deciding the location of the intake, referring to the geographical features of the development area, the situation of the water source, the situation of the proposed intake site, etc.

**3-4 Water balance study**

Describe the results of the water balance study, using the table below and referring to Form-5 and Form-6 attached. Also, explain the reason for determining the development area from the water balance study.

Calculation of irrigable area-(Name of scheme)

Description	Dry season	Rainy season
River discharge (m <sup>3</sup> /s)		
80% dependable river discharge (m <sup>3</sup> /s)		
Gross unit water requirement (litter/s/ha)		
Irrigable area (ha)		

Determination of development area-(Name of scheme)

Proposed area (ha)	
Irrigable area in rainy season (ha)	
Development area (ha)	

Calculation of irrigable area-(Name of scheme)

Description	Dry season	Rainy season
River discharge (m <sup>3</sup> /s)		
80% dependable river discharge (m <sup>3</sup> /s)		

Description	Dry season	Rainy season
Gross unit water requirement (litter/s/ha)		
Irrigable area (ha)		

**Determination of development area-(Name of scheme)**

Proposed area (ha)	
Irrigable area in rainy season (ha)	
Development area (ha)	

In "4. Preliminary facility planning," describe only the scheme(s) finally selected for DADP.

Do not describe all the schemes surveyed and studied.

**4 Preliminary facility planning**

Describe the planned facilities, using the table below and referring to Form-7 and the scheme development plan map attached.

**Outline of planned facilities-(Name of scheme)**

Planned facility	Specification / Quantity
Weir/ Intake	Width W = m Height H = m
Pump	Head H = m Capacity per unit Q = m <sup>3</sup> /hr Number of units N = units
Main canal and associated structures	Command area A = ha Length L = m Lined or unlined
Irrigation facilities in the development area	Development area A = ha
Drainage facilities in the development area	Development area A = ha
Flood dike	Height H = m Length L = m
Village access road	Length L = m
Village bridge/River crossing	Number N = nos Total length L = m

(See Form-7 and "Scheme development plan map" attached hereto.)

**Outline of planned facilities-(Name of scheme)**

Planned facility	Specification / Quantity
Weir/Intake	Width W = m Height H = m
Pump	Head H = m Capacity per unit Q = m <sup>3</sup> /hr Number of units N = units
Main canal and associated structures	Command area A = ha

Planned facility	Specification / Quantity
	Length L = m Lined or unlined
Irrigation facilities in the development area	Development area A = ha
Drainage facilities in the development area	Development area A = ha
Flood dike	Height H = m Length L = m
Village access road	Length L = m
Village bridge/River crossing	Number N = nos Total length L = m

(See Form-7 and "Scheme development plan map" attached hereto)

### 5. Summary of cost estimate

In "5. Summary of cost estimate," describe only the scheme(s) finally selected for DADP. Do not describe all the schemes surveyed and studied.

The scheme development cost is summarized below:

#### Summary of scheme development cost

Description	Estimated cost (Tshs.)	
	(Name of scheme)	(Name of scheme)
Weir/Intake		
Pump		
Main canal and Associated structures		
Irrigation facilities in the development area		
Drainage facilities in the development area		
Flood dike		
Village access road		
Village bridge/River crossing		
Total construction cost		
Soft component cost		
Administration cost		
Engineering services cost		
Scheme development cost		

### 6. Institutional development plan

In "6. Institutional development plan," describe only the scheme(s) finally selected for **ISD**. Do not describe all the schemes surveyed and studied.

Describe the institutional development plan, referring to Form-9 attached.

**7. Environmental consideration**

In "7. Environmental consideration," describe only the scheme(s) finally selected for **ISD**. Do not describe all the schemes surveyed and studied.

Describe the specific environmental issues in the selected scheme(s).

**8. Scheme evaluation**

In "8. Scheme evaluation," describe all the schemes surveyed and studied.

Describe the results of the scheme evaluation and the reasons for the final selection of the scheme(s) for **ISD**, using the table below.

Prioritization of schemes

Name of scheme	Ranking				Final ranking
	Adequacy	Efficiency	Dependability	Equity	
		EIRR: %			
		EIRR: %			
		EIRR: %			
		EIRR: %			

(See Form-11 attached hereto.)

**9. District supporting programmes**

Describe the design of the district supporting programmes and the reasons for the necessity of those programmes, referring to the Form-13 attached.

District supporting programmes

Title of district supporting programme	Outline
	Goal: Activities: 1. 2. 3.

## Supplementary Explanations

	<b>Goal:</b> <b>Activities:</b> 1. 2. 3.
	<b>Goal:</b> <b>Activities:</b> 1. 2. 3.

(See Form-13 attached hereto.)

### 10. Implementation plan

Explain the phase-wise development plan and the contents of the activities in the next financial year, using the list and the table below, and referring to Form-14 attached.

#### List of activities in the next financial year

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

#### Implementation plan

Description	Estimated cost (Tshs.)	Purposed resources
Scheme formulation planning for next <b>ISD</b>		(To be financed by DADG basic)
Total scheme development cost		
(Name of scheme)		
Initial investment		
Farmers' contribution		
District Council's contribution		
(Name of scheme)		
Initial investment		

Description	Estimated cost (Tshs.)	Purposed resources
Farmers' contribution		
District council's contribution		
Phase-wise development plan		
(Name of scheme)		
Phase-1		
Phase-2		
Phase-3		
Phase-4		
Phase-5		
Total		
(Name of scheme)		
Phase-1		
Phase-2		
Phase-3		
Phase-4		
Phase-5		
Total		
Scheme development in the next financial year (Phase-1)		(To be financed by DADG basic or enhanced)
District supporting programme		
(Title 1)		
(Title 2)		
(Title 3)		
Total		(To be financed by A-CBG)

(See Form-14 attached hereto)

DADG basic, enhanced and A-CBG indicated in this table are just examples. Consider the actual situation of **ISD** Financing system.

## Supplementary Explanations

### 9. Criteria for requesting fund

Requests for **ISD** financing will be submitted annually, and will be scored according to the criteria shown below.

SNo	Criteria	Maximum score (percentage)
<b>1</b>	Economic Internal Rate of Return (EIRR)	<b>40</b>
<b>2</b>	The level of alternative sources of funding (LGCDG, DADG) that Districts allocate to the proposed investment	<b>20</b>
<b>3</b>	The level of farmers' contribution to the capital investment costs	<b>20</b>
<b>4</b>	The complementarity of CBG and EBG funded activities to the irrigation investment	<b>10</b>
<b>5</b>	The level of funds that are allocated to software activities such as capacity strengthening of Irrigators Organizations	<b>10</b>
Total		100

**Attachment- 1 Relevant Guidelines and Manual**

## **Relevant Guidelines and Manuals**

### **1. Guidelines for District Agricultural Development Plans (DADPs)**

A DADP is a three-year rolling plan of agricultural sector development at the district and field levels under Sub-Programme as specified in the Agricultural Sector Development Programme (ASDP). The guidelines for preparation of DADPs were issued in January 2003, and the 1st DADPs were prepared in March 2003. The guidelines were then revised in November 2003, and revised again in November 2006.

The process of irrigation scheme formulation and development under DADP in accordance with the DADP Guidelines is shown in the figure on Page 1-3, "Section 1 Introduction" of this volume of the Formulation Guidelines.

Furthermore, the financing system for DADP and the funding sources for the districts' activities relating to irrigation scheme formulation and development are summarized on Page 3-59 to Page 3-60, "Supplementary Explanations," "Section 3 Irrigation Scheme Formulation for DADP" of this volume of the Formulation Guidelines.

The Guidelines for Irrigation Scheme Formulation were worked out in the framework of the guidelines for preparation of DADPs.

### **2. Other Relevant Guidelines and Manuals for Irrigation Development**

There are many relevant guidelines and manuals that have been mostly prepared in the DITS of MAFS on an individual project basis. These are:

- Guidelines for Participatory Improvement to Farmers Initiated and Managed Smallholder Irrigation Schemes, July 2003
- Project Planning Manual (See Attachment-1)
- Irrigation Design Manual (See Attachment-1)
- Rainwater Harvesting Design Manual for Irrigated Agriculture in Marginal Areas (See Attachment-1)
- Irrigation Water Management Field Handbook for Extension Staff (See Attachment-1)

For the District staff's information and reference, the key issues covered by these guidelines and manuals are briefly explained as follows:

## **(1) Guidelines for Participatory Improvement to Farmers Initiated and Managed Smallholder Irrigation Schemes, July 2003**

The guidelines were prepared for use in national, regional and district level programmes for all types of improvement of farmer-initiated and farmer-managed irrigation schemes, in a sector-wide framework proposed in ASDP. The guidelines were compiled for rehabilitation and/ or improvement of existing irrigation schemes; however the principles embodied in them would be applicable for new development schemes. The guidelines adopt an eleven-step approach to participatory planning and implementation of cost-effective, profitable, farmer-initiated and farmer-managed smallholder irrigation investment projects. The eleven steps are as follows:

### **Step-by-Step Approach**

<b>No.</b>	<b>Activities</b>
0	Selection of Districts
1	Selection of Schemes
2	Participatory Action Planning
3	Registration as Legal Entity/Letter of Undertaking
4	Participatory Diagnostic Study
5	Participatory Design/Feasibility Study
6	Joint Investment Decision/Financing Agreements
7	Detailed Designs/Tender Documents
8	Tendering/Contract Award
9	Implementation
10	Operation & Maintenance

Source: Guidelines for Participatory Improvement to Farmer Initiated and Managed Smallholder Irrigation Schemes

As can be seen in this table, the guidelines do not indicate how to pick the irrigation schemes from the farmers through the Village Government. All irrigation schemes are assumed to be in the hands of the District Offices. Therefore, the process starts from the selection of schemes in the District Offices, although selection of districts is preferentially mentioned assuming the programme support by donors.

In each step of irrigation scheme development process under DADP, the guidelines clearly state Why", "How", "Who" and the results. Such an approach enables the District staff concerned to easily understand the development process, so the guide them.

## **(2) Project Planning Manual**

The manual consists of the following eleven sections:



### Composition of Manual

Section	Title
1	Preliminary Appraisal of Proposed Irrigation Schemes
2	Topographic Surveys
3	Soil Survey and Land Classification
4	Climate and Hydrology
5	Socio-economic Surveys
6	Agronomy
7	Irrigation Water Requirements
8	Engineering
9	Organization, Operation and Maintenance
10	Financial and Economic Analysis
11	The Feasibility Report

The manual was prepared to provide guidelines on investigation and studies necessary for feasibility study. It covers almost all items necessary for irrigation scheme planning from survey to project evaluation, although planning for rain water harvesting is not included. It seems that the manual focuses on medium- to large-scaled schemes, the so-called modern irrigation schemes in Tanzania, and its contents are sufficient to target relatively sophisticated irrigation systems. The manual states that the main users of the manual are expected to be the staff of project planning of ZITSU and DITS of MAFC. In this sense, the manual might be unwieldy for less experienced users, but is a good guideline for persons of middle standing who want to accumulate further knowledge.

### (3) Irrigation Design Manual

The manual is composed of two volumes: guidelines and drawings. The guidelines consist of the following ten chapters:

#### Composition of Guidelines

Chapter	Title
1	Project Identification Process
2	Site Investigation and Survey
3	Water Resources Studies
4	Water Demand
5	Drainage of Agricultural Lands
6	Irrigation Scheme Design
7	Design of Structures and Infrastructure
8	Design of Diversion Weirs
9	Design of Silt Excluders
10	Drawing Office Standards

The guidelines present the activities necessary for design works along with detailed exercises. The guidelines might be useful for the government staff/experts with some experiences in irrigation design works, but Troublesome for those with less experience, such as District staff, because most of the guidelines were prepared by reference to technical papers like FAO Irrigation and Drainage Papers. In addition, the guidelines do not deal with

methodology for participatory design, which is now a fundamental requirement.

#### **(4) Rainwater Harvesting Design Manual for Irrigated Agriculture in Marginal Areas**

This manual was prepared in the Participatory Irrigation Development Programme (PIDP) for the design of rainwater harvesting, presently a high priority approach in marginal areas. Its contents are tabulated below:

**Composition of Guidelines**

<b>Chapter</b>	<b>Title</b>
1	Techniques and Identification Process
2	Site Investigation and Survey
3	Water Resources Studies
4	Scheme Water Demand
5	Earth Dams and Levees
6	Drainage of Agricultural Lands
7	Irrigation Scheme Design
8	Design of Irrigation Infrastructure
9	Design of Diversion Weirs
10	Design of Silt Excluders
11	Scheme Cost Estimation

Of the eleven chapters, only a few chapters are original; the remaining chapters are copies of the Irrigation Design Manual mentioned previously.

#### **(5) Irrigation Water Management Field Handbook for Extension Staff**

This handbook was prepared under the Agricultural Sector Programme Support (ASPS), aiming to provide extension field personnel with information on irrigation water management and to build their skills and capacities. The handbook is composed of the following ten chapters:

**Composition of Handbook**

<b>Chapter</b>	<b>Title</b>
1	Introduction
2	Source of Water
3	Measurement of Irrigation Water
4	Irrigation Systems and Water Application Methods
5	Basic Soil-Water Plant Relationships
6	Crop Water Requirement
7	Operation of Irrigation Facilities and Structures
8	Drainage
9	Maintenance, Repair and Rehabilitation of Irrigation Facilities and Structures
10	Organization of Irrigators' Association
11	Environmental Issues in Irrigation Systems

The handbook is prepared to be easily understandable for extension officers for water management. The handbook treats not only technical issues, but also the formation, registration and operation of irrigators' associations. Furthermore, the handbook refers to the environmental issues brought by irrigation development, such as (i) soil degradation, (ii) deterioration of groundwater quality, (iii) deterioration of surface water quality, and (iv) water logging. Ways and means to remedy these problems are also clarified in the handbook. With these contents, the handbook provides important reference information for the District staff in other agricultural fields as well as the extension workers.

## **Attachment- 2 Summary ofthe National Irrigation Master Plan**

## Summary of the National Irrigation Master Plan

### 【Background】

The National Irrigation Development Plan (NIDP) prepared in 1994 required revision due to its unsatisfactory implementation and the need for consistency with the new government policies, i.e., the "Agriculture and Livestock Policy, 1997", "Tanzania Development Vision 2025, 2000", and the "Agricultural Sector Development Strategy, 2001". The Government of Tanzania (GOT) therefore requested the Government of Japan (GOJ) to extend technical assistance and undertake the Study on the National Irrigation Master Plan (NIMP). The GOJ agreed to this request, and a Scope of Work was signed by both parties on April 10, 2001. "The Guidelines for Irrigation Scheme Formulation for DADP" were prepared as a part of the activity of NIMP study.

### 【Objectives】

- Formulate the Master Plan for irrigation development at a national level with a target year of 2017
- Carry out technology transfer to the counterpart personnel through on-the-job training in the course of the Study

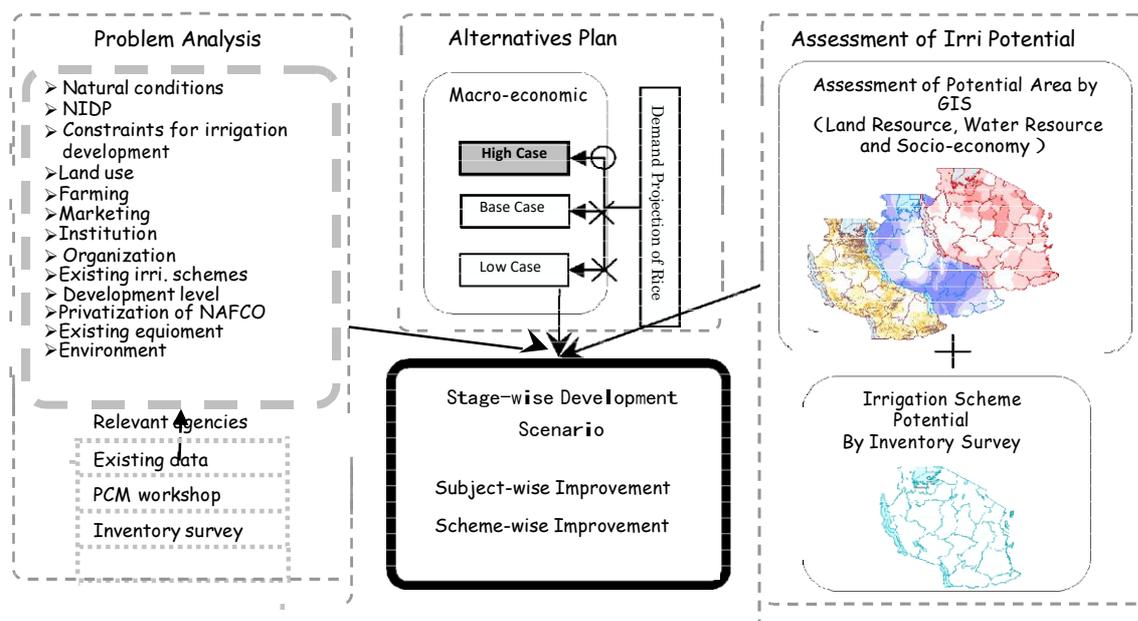
### 【Methodology of Study】

There is no doubt that irrigation contributes to the stabilization of agricultural production. However, irrigation by itself could not realize the remarkable increase of agricultural production without interventions from other sub-sectors such as agricultural inputs and extension services. The other sub-sectors therefore require to be developed in close co-ordination with the irrigation sub-sector to achieve a significant increase in agricultural production.

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. In consideration of the strategic activities/interventions stipulated in the ASDS and philosophy employed in the NIDP and also the study results, "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. "Sustainable Irrigation Development" means the establishment of technically and financially self-reliant irrigation schemes through institutional and organizational strengthening/reform.

The study first conducted problem analysis on the existing irrigation schemes and assessed irrigation potential. Based on these results, a stage-wise development scenario was worked out for 15 years from 2003 to 2017 in a well-considered framework of policy, macro-economy and demand projection of staple food. The NIMP was formulated with the two ideologies of Subject-wise Improvement and Scheme-wise Development, and close linkage between them, as a strategic approach to sustainable irrigation development. The following is a flow chart showing how NIMP was formulated.

## Formulation Flow of National Irrigation Master Plan



The major points covered in the study are discussed below.

### 【Problem Analysis】

In the Study, problem analysis was carried out from the results of five PCM workshops and an inventory survey of 1,428 existing and proposed irrigation schemes as well as data collected from the relevant agencies.

### 《PCM Workshops》

Subjects and participants of the respective PCM Workshops are given in the table at right.

In the Study, the PCM Workshops were held five times, and then objective analysis was made for problem analysis for each subject.

### 《Inventory Survey》

An analysis was made for 1,428 irrigation schemes consisting of 739 irrigation schemes inventoried by the World Bank and

689 irrigation schemes recorded in the NIMP Study, which totally covered all of mainland Tanzania. The inventory survey indicated a total irrigation area of 854,000 ha.

### 【Assessment of Irrigation Potential Area】

In general, irrigation development potential is assessed from the water resources potential and land resources potential only. In the NIMP Study, socio-economic potential was also taken into consideration, because marketing conditions are very important for irrigation development and

PCM Workshops

Subjects	Participants
Awareness on 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

have a large influence on the selection of irrigation schemes. The possible extent of irrigation development was determined by preparing and overlaying the assessment maps for the respective potentials mentioned above. The locations of existing irrigation schemes were then inventoried and plotted on the irrigation potential map to examine the consistency between the map and existing irrigation schemes. The results were used for preparing a regional development plan. Indicators employed for assessment were as follows:

«Land Resources Potential»

Land resources potential was assessed using land cover, topography and land unit maps, as shown in the figure at right.

«Water Resources Potential»

Areas of high water resources potential were defined as those with an average annual specific run-off of more than 1.0 m<sup>3</sup>/sec/500km<sup>2</sup>.

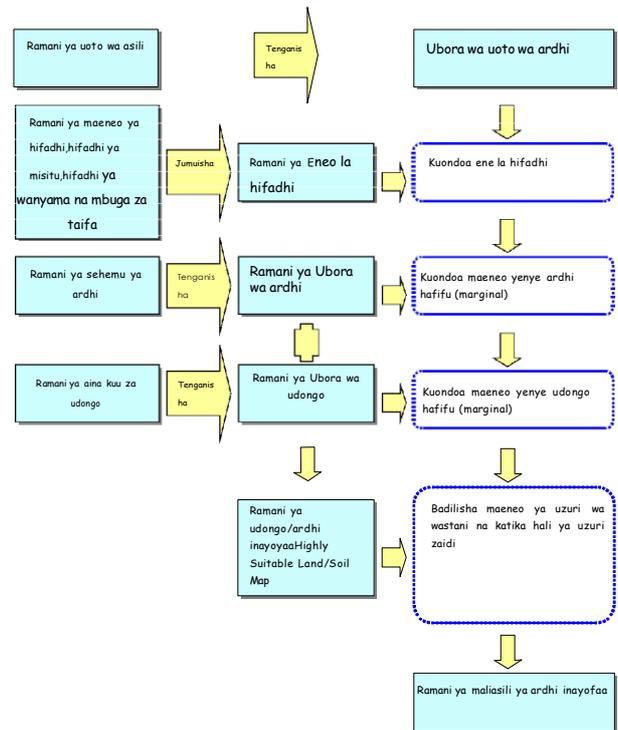
«Socio-economic Potential»

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

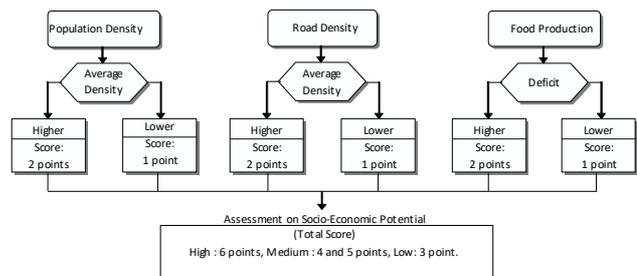
【Alternative Study on Development Plan】

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

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Assessment Flow of Socio-Economic Potential

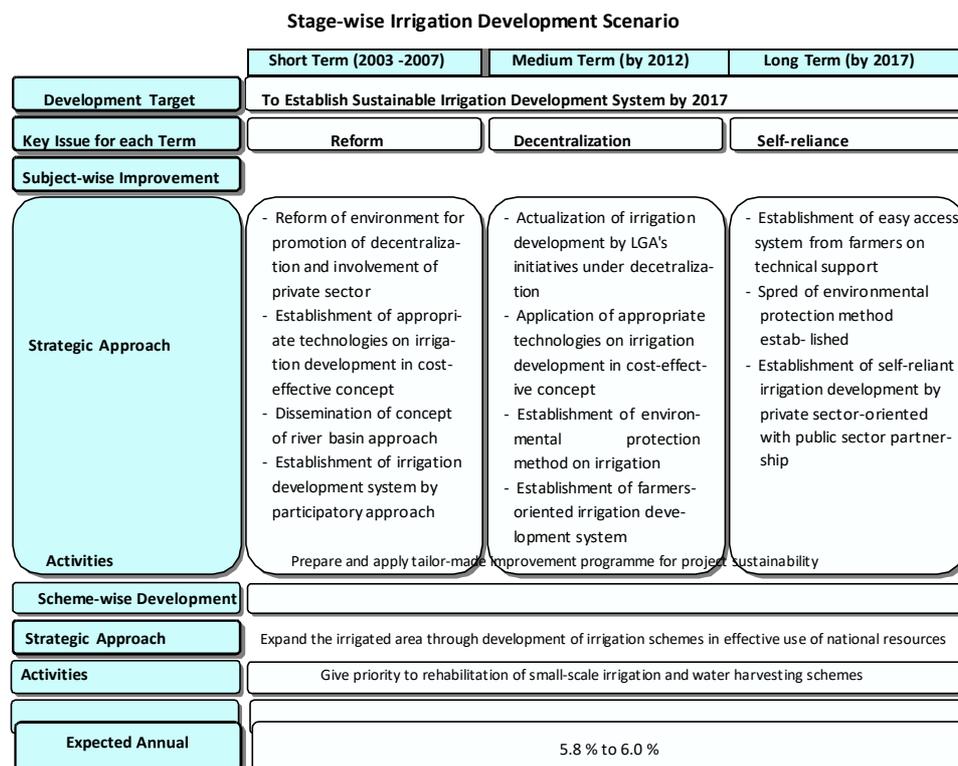


Conditions of Sensitivity Analysis

	Base Case	High Case	Low Case
GDP Growth Rate	5.8% for 2003/04 - 2007/08 5.9% for 2008/09 - 2012/12 6.0% for 2013/14 - 2017/18	1.0% p.a. above Base Case	5.1% p/a/ 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 Jsh.	350,042	451,251	327,967
Amount in million US\$	369	475	345

### 【 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). As mentioned above, the NIMP adopted the two ideologies of Subject-wise Improvement and Scheme-wise Development. Subject-wise Improvement targets enhancing scheme quality and Scheme-wise Development targets expansion of irrigation areas and diversity; the overall objective is to attain sustainable irrigation development.



### 《 Subject-wise Improvement Programme 》

The Subject-wise Improvement Programme consists of several programmes: (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 survey.

### 《 Scheme-wise Development Programme 》

The 1,428 irrigation schemes, with total estimated irrigation area of about 854,000 ha, were prioritized using the following six items, and then classified into five groups of ranked priority.

#### Criteria for Scheme Prioritization

Technical Factors	Economical Factors	Environmental Factors	Ease of Implementation	Social Factors	Regional Conditions	Total
15 points	30 points	10 points	5 points	20 points	20 points	100 points

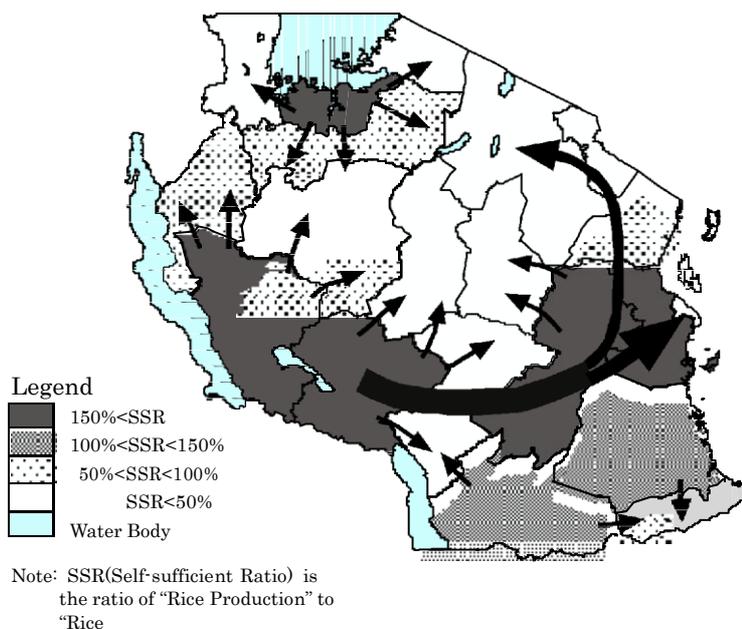
Based on the prioritization of irrigation schemes and projected development budget, the irrigation development areas were estimated as follows:

**Accumulated Irrigation Development Area**

Description	Short Term	Medium Term	Long Term
	2003 - 2007	by 2012	by 2017
(a) Nos. of Schemes	141	305	626
(b) Irrigation Development Areas (accumulated)	265,200 ha	324,900 ha	405,400 ha

**【Regional Development Programme】**

An irrigation development area of 405,000 ha would contribute to the achievement of national rice self-sufficiency by 2017. In addition, rice production levels at regional level were examined taking into consideration the policy of "suitable product on suitable land". Projected rice demand was compared against the development of selected priority schemes, and, as a result, rice surplus in 2017 would occur in seven regions (out of 20): Coast, Lindi, Mbeya, Morogoro, Mwanza, Rukwa, and Ruvuma. Judging from the variations in rice production and road conditions, the re-distribution plan shown in the figure at right was conceived.



## 【 Conclusions 】

The Study presents a framework and set of strategies for sustainable irrigation development for mainland Tanzania with the target year of 2017; the overriding aim is to contribute to the 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 components of Subject-wise Improvement Programme and 626 irrigation schemes of Scheme-wise Development Programme.

In preparing the development programme, the Study established a system for the prioritizing of candidate irrigation schemes for implementation and conducted a priority ranking of potential schemes using the data and information obtained through the inventory survey. 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 Study concludes that the implementation of these programmes would have a high probability of meeting the future demand of rice by 2017 with successful inter-sectoral coordination.

**Attachment- 3 Additional Explanation on Economic Analysis of the Scheme.**

## Additional Explanation on Economic Analysis of the Scheme

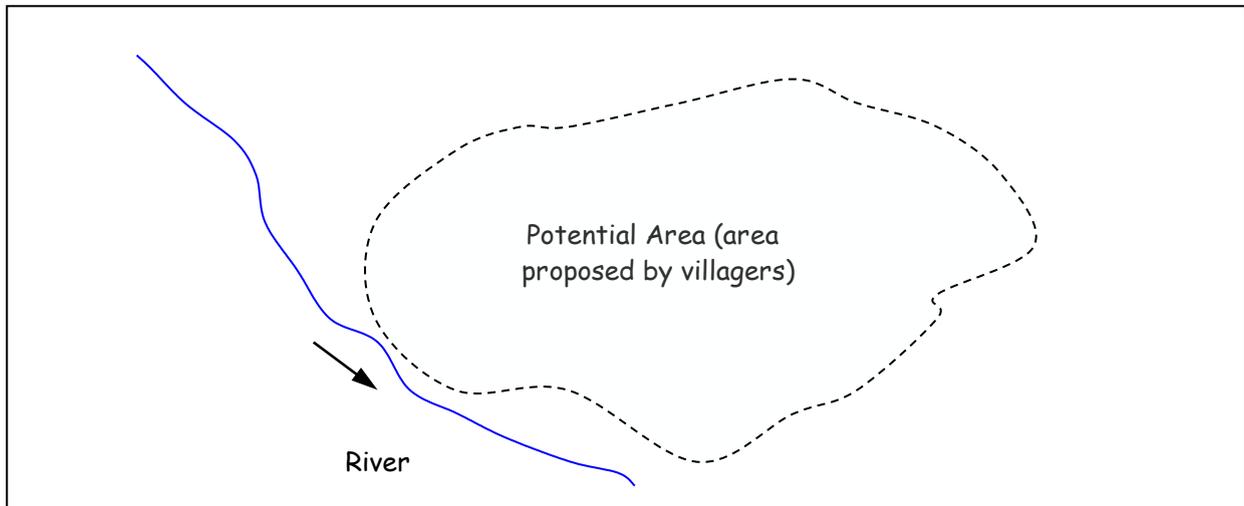
Before implementing scheme development, economic, social, technical, environmental and economic viability of the scheme should be confirmed.

Economic viability of the scheme should be checked by the following process.

(1) Determine the development area

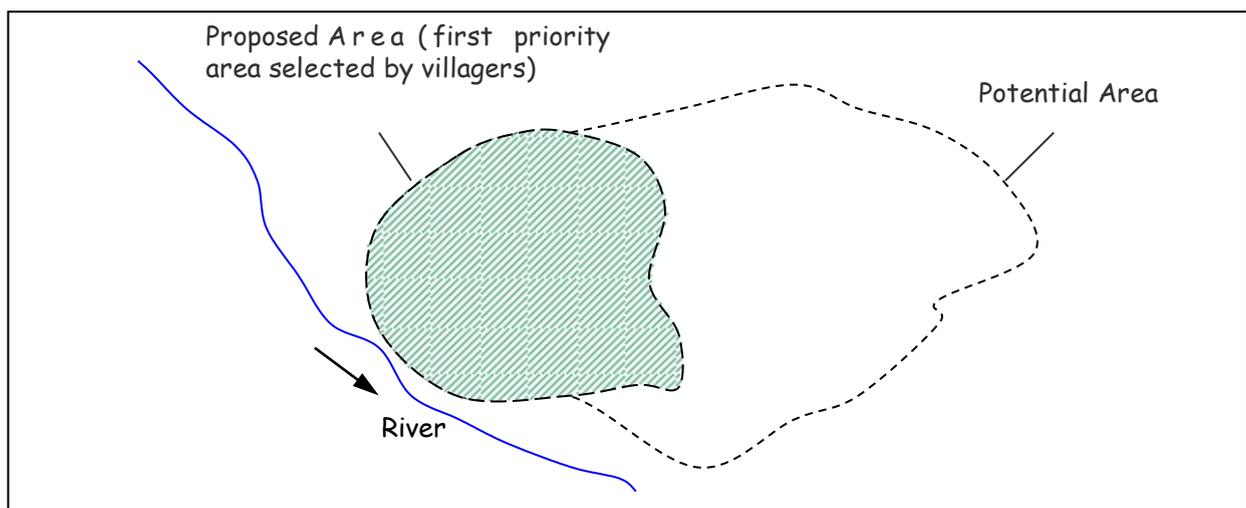
### Situation 1 (situation of O&OD or village proposed plan)

Some area is proposed to be irrigated by villagers.



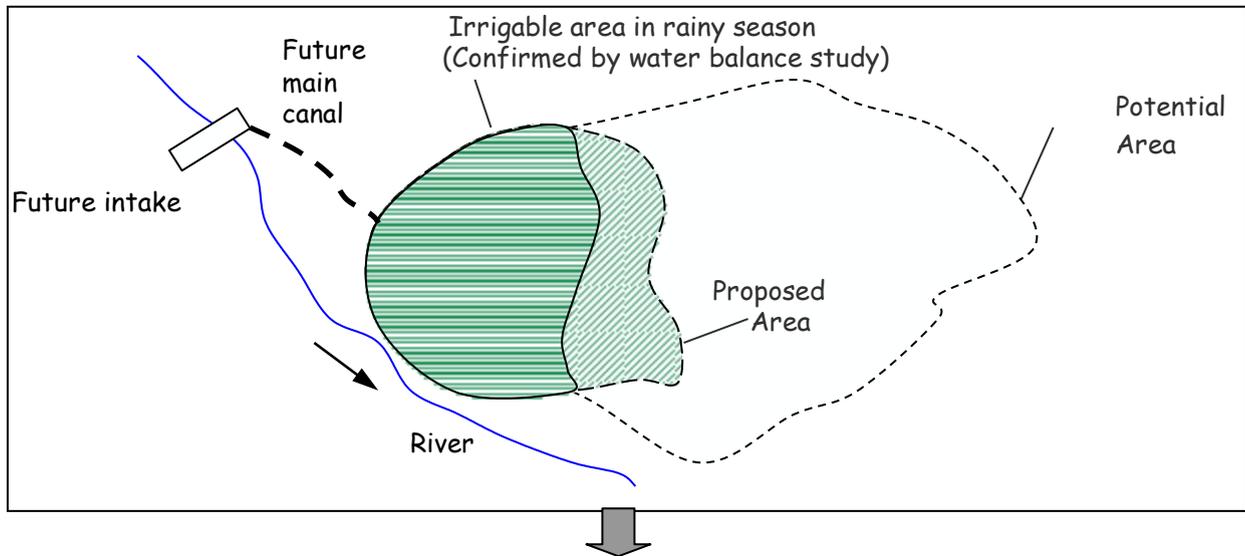
### Situation 2 (after reaching agreement on the proposed area)

Potential area may be too large for development due to budget limitation.



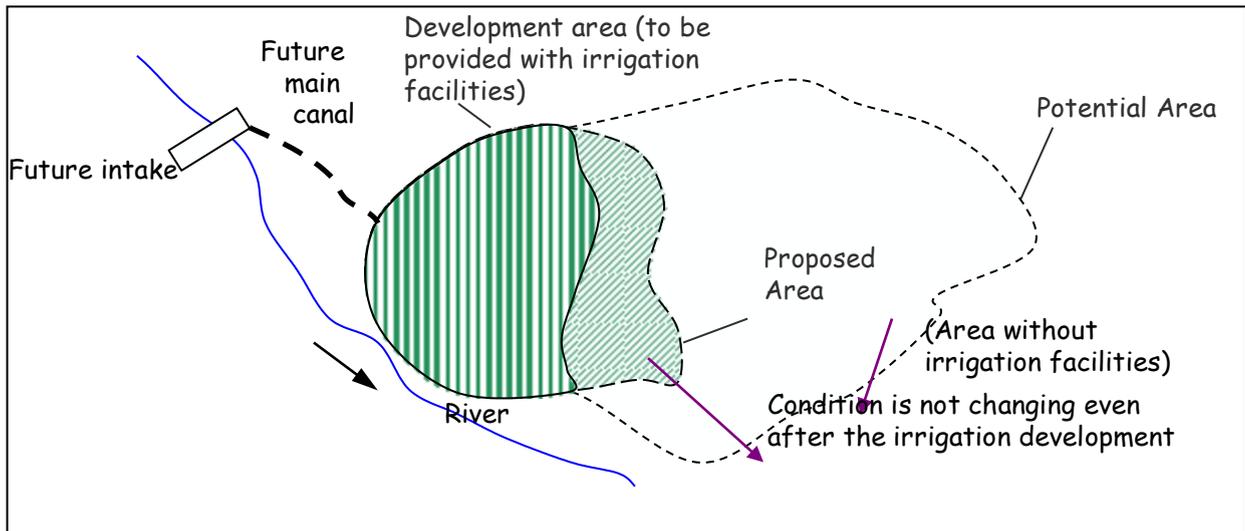
Situation 3 (after water balance study)

Not all of the proposed area may be irrigable due to water resources limitation.



Situation 4 (development area decided)

In this example, the irrigable area in the rainy season is determined to be the development area since it is smaller than the proposed area..



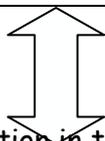
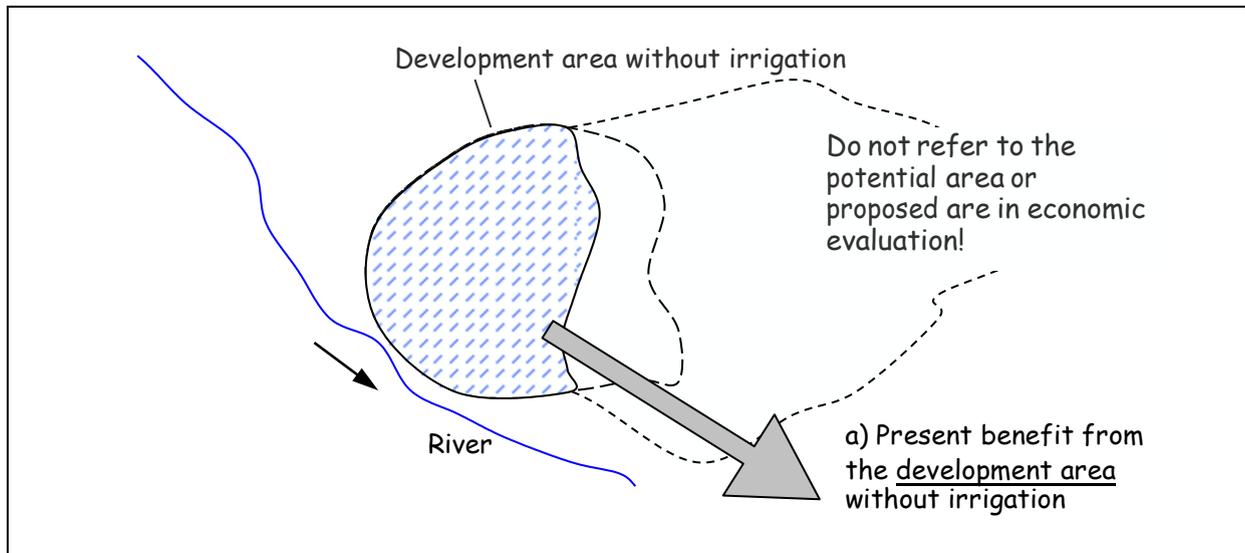
Caution

Once the development area is determined, only this area should be used for the economic analysis. Do not refer to the potential area or proposed area. Since the conditions in the rest of the development area will not change after irrigation development, it should be neglected in the economic analysis.

(2) Economic Evaluation

Without project condition

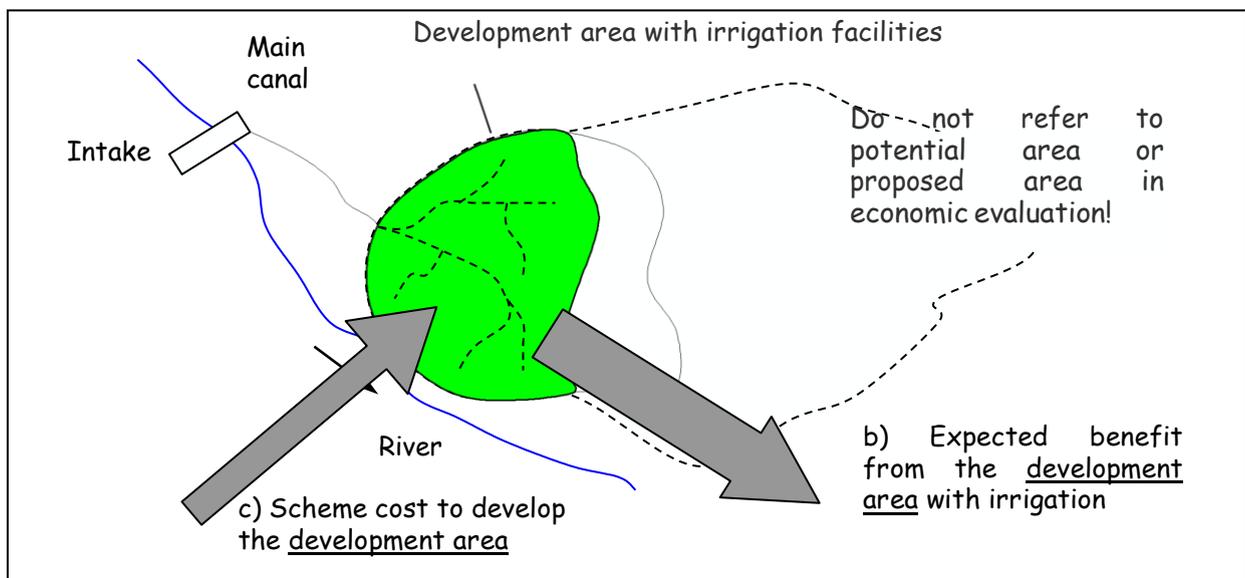
Without project condition means the condition in the development area at present.



Compare condition in the same area (development area) for without and with condition

With project condition

With project condition means condition in the development area after development..



Incremental agricultural benefit = b) - a)

Before starting the development, it should be confirmed that the scheme cost (investment) is larger than the incremental agricultural benefit (return on investment). However, simple comparison of the two is not enough since inflation within the life of the project (30 years) should be considered. EIRR (Economic Internal Rate of Return) analysis provides an investment vs. return comparison accounting for inflation.

**Attachment- 4 Review Paper For Irrigation Scheme Formulation Plan Report.**

# **THE UNITED REPUBLIC OF TANZANIA**

## **NATIONAL IRRIGATION COMMISSION**



## **REVIEW PAPER FOR IRRIGATION SCHEME FORMULATION PLAN REPORT**

## TABLE OF CONTENT

1. Introduction
2. Assessment criteria
3. Clarification of unclear matter/parts
4. Assessment of results
5. Conclusion and recommendation
6. Attachment

## **1. Introduction**

The relevant information was given by DIDT through the formulation plan report. The report contained the following:

- Introduction
- Present condition of the targeted irrigation scheme
- Basic plan
- Preliminary facility plan
- Summary of cost estimate
- Institution development plan
- Environmental consideration
- Scheme evaluation
- District supporting programmes
- Implementation plan
- List of attachment

Zonal review committee examined the report and prepared the review paper by compiling the review result. Zonal Irrigation engineer submitted a validation and agreement letter to DIDT on behalf of the ZRC.

## **2. Assessment criteria**

The zonal review committee assessed the irrigation scheme formulation plan report by the following criteria

- Completeness of formulation plan report document
- Procedure for Prioritization of irrigation scheme (Dependability, adequacy, equity)
- Field survey results on each irrigation scheme (soil type, water source, village resource map)
- Preliminary development plan on each irrigation scheme (water balance, EIRR, Scheme development plan map)
- District supporting programme digest (Contribution of the district)

### 3. Clarification of unclear matter/parts

-State if there is unclear matter or not

### 4. Assessment of results

S/N	Assessment criteria	Remarks
1	Completeness of formulation plan report document	
2	Procedure for Prioritization of irrigation scheme (Dependability, adequacy, equity)	
3	Field survey results on each irrigation scheme (soil type, water source, village resource map)	
4	Preliminary development plan on each irrigation scheme (water balance, EIRR, Scheme development plan map)	
5	District supporting programme digest (Contribution of the District)	

### 5. Conclusion and recommendation

The report was found to meet all the criteria and the Zonal Review Committee advised Zonal Irrigation Engineer to write a validation and agreement letter to DIDT on behalf of zonal review committee for further steps of formulation as per CGL.

### 6. Attachment

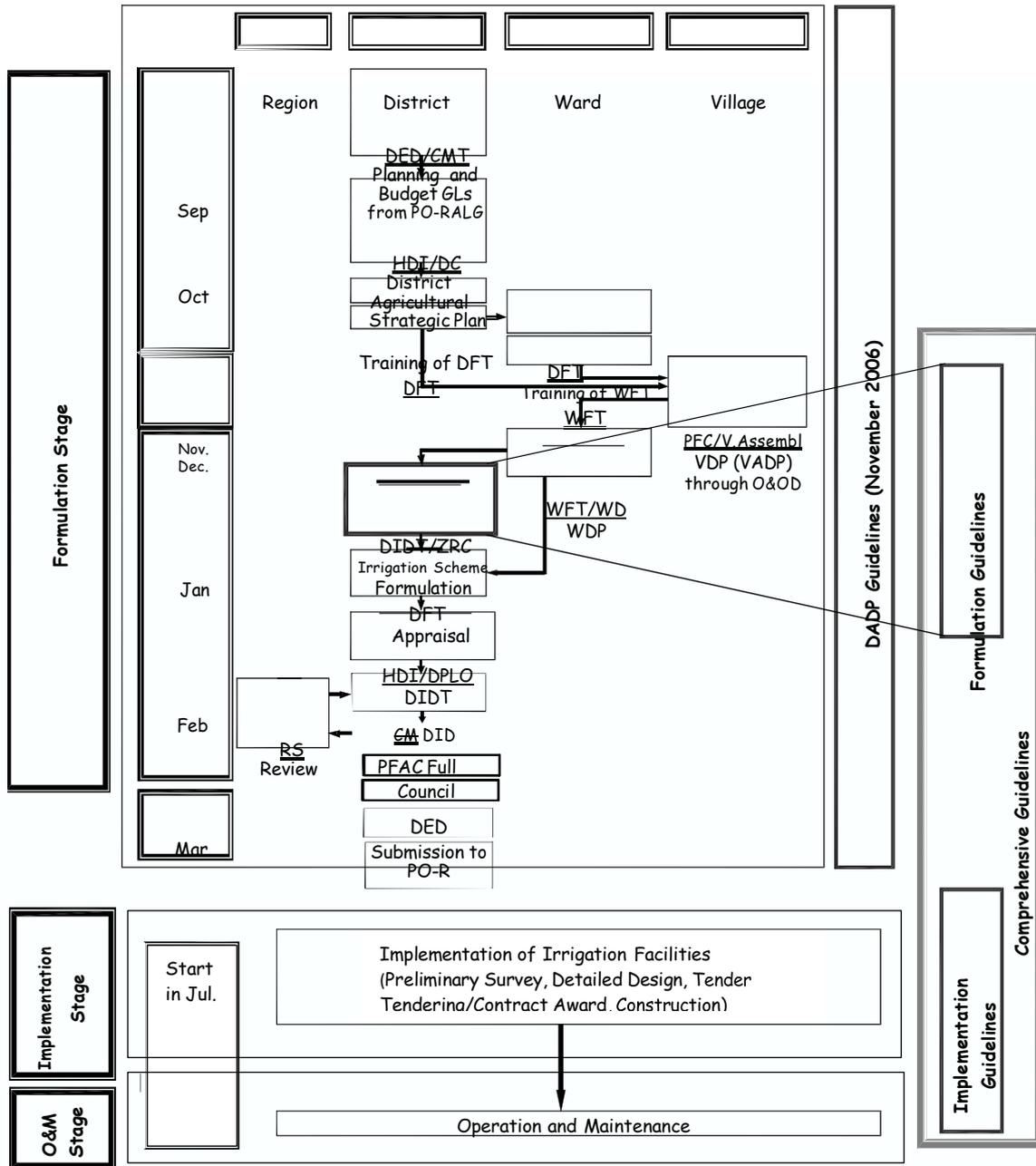
I. Validation and agreement letter

II. Zonal Review Committee list

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# **SECTION 5 GENERAL INFORMATION**

# Outline of Irrigation Scheme Formulation and Development Process For ISD



In this process, the target stage for these guidelines is the formulation of irrigation Schemes.

#### **(4) Implementation Guidelines**

The implementation *Guidelines* that covers implementation stages of irrigation scheme development (e.g., designing, tendering procedures, contract management, supervision, O&M) will be prepared during the course of the Technical Cooperation.

#### **(5) Flow of Irrigation Scheme Formulation and Outputs Derived from Steps**

Flow of irrigation scheme formulation and outputs derived from activities of steps are shown on the next page.

**Procedure to be taken before ISD Stage**



## Procedure to be taken before ISD Stage

### (1) General

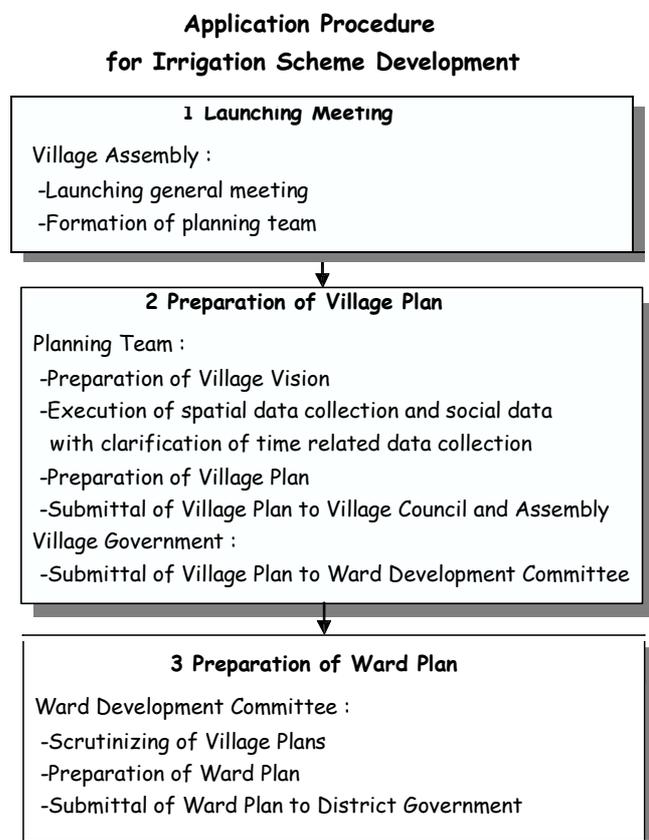
As mentioned in Section 1 "Introduction", all irrigation schemes to be developed will be requested by villages by applying through the village government and ward development committee to the district government, i.e., using a bottom-up approach. In order to realise this application for irrigation scheme development with bottom-up approach, the Guidelines for ISD propose to use the Opportunities and Obstacles to Development (O&OD) which is accepted by the government as a participatory planning methodology. These Guidelines for Irrigation Scheme Formulation for ISD, therefore follow the same methodology to identify only irrigation schemes that are demanded by villagers.

### (2) Procedure for Application to District Government

The application procedure for irrigation scheme development from farmers to their district government should be in accordance with the "TARATIBU ZA UANDAAJI MPANGO SHIRIKISHI JAMII KWA KUTUMIA FURSA NA VIKWAZO KWA MAENDELEO, April 2002" (the Guidelines for Preparing a Participatory Community Development Plans based on Opportunities and Obstacles to Development) and the Guidelines for District Agricultural Development Plans, November 2003. The application procedure derived from

these two guidelines is largely divided into three parts, namely 1 Launching Meeting, 2 Preparation of Village Plan, and 3 Preparation of Ward Plan, of which the major activities are outlined in the figure at right.

The Village Plan and Ward Plan will only the irrigation sector, but also other sectors like education, health, roads, marketing, etc., and priority schemes will be selected from them in the light of District Vision and also ASDP and ASDS objectives.



## Process of Irrigation Scheme Development after ISD Stage

### (1) General

The irrigation schemes included in ISD will be developed based on the Guidelines for Participatory Improvement to Farmer Initiated and Managed Smallholder Irrigation Schemes, July 2003. The proposed process of irrigation scheme development after selecting an irrigation scheme, as presented in the guidelines, is outlined hereinafter (refer to the said guidelines for details).

### (2) Process of Irrigation Scheme Development after Selection

After a scheme is selected for ISD, the scheme will be developed with a participatory approach. The process is composed of the following nine stages:

- 1 Participatory Action Planning,
- 2 Registration as Legal Entity/Letter of Understanding,
- 3 Participatory Diagnostic Study,
- 4 Participatory Design/Feasibility Study,
- 5 Joint Investment Decision/Financing Agreement,
- 6 Detailed Design/Tender Documentation,
- 7 Tendering/Contract Award,
- 8 Implementation,
- 9 Operation and Maintenance.

The beneficial irrigators, as the main actors, will mostly take part in activities at these stages. The Government agencies concerned at each stage are shown in the figure at right.

#### Process of Irrigation Scheme Development

##### 1 Participatory Action Planning

District Irrigation Development Team:  
 - Planning for the selected Irrigation Schemes  
 ZIO/RIO:  
 - Facilitation of the above preparation activity.

##### 2 Registration as Legal Entity/Letter of Undertaking

District Irrigation Development Team:  
 - Facilitation of the registration as legal entity  
 ZIO/RIO:  
 - Backstopping for DIDT.

##### 3 Participatory Diagnostic Study

Intended participants:  
 - Study for enhancement of prospects for investment being irrigator-driven, and responsive to real market opportunities or need to overcome real constraints.  
 ZIO/RIO:  
 - Guidance to the above process

##### 4 Participatory Design/Feasibility Study

Private consultant:  
 - Participatory Design and Feasibility Study.  
 District Council:  
 - Supervision of District Council  
 ZIO/RIO/NIC:  
 - Guidance to the above process.

##### 5 Joint Investment Decision/ Financing Agreement

Irrigators' legal entity and District Council:  
 - Exchange of a financial agreement with District Council and  
 NIC:  
 - Exchange of a financial agreement for donor's assist

##### 6 Detailed Design/Tender Documentation

Private consultant:  
 - Detailed design and preparation of tender documents.  
 District Council:  
 - Supervision of private consultant  
 ZIO/RIO/NIC:  
 - Backstopping for District Council

##### 7 Tendering/Contract Award

District Council Tender Board  
 - Conduct of tendering and contract award.  
 Tender Evaluation Team appointed by the Board  
 - Assistance and advice to the Board in this activities.

##### 8 Implementation

Private consultant:  
 - Construction supervision for construction of irrigation scheme by private contractor.  
 ZIO/RIO/NIC:  
 - Backstopping for District Irrigation Development Team

##### 9 Operation and Maintenance

Irrigators' Organization:  
 - Operation and maintenance of irrigation scheme.  
 District Staff:  
 - Technical support for Irrigators' Organization  
 ZIO/RIO/NIC:  
 - Backstopping for District Staff

## Process of Irrigation Development after ISD Stage

The activities mentioned in the guidelines are re-iterated as follows:

### Major Activities at each Stage

Stages	Major Activities
1 Participatory Action Planning	Series of short planning workshops: - to identify the nature of intervention intended by irrigators - to define allocation of responsibilities for meeting costs of the preparatory activities
2 Registration as Legal Entity/Letter of Undertaking	- Registration of the scheme as an organisation/cooperative/company as preferred by the membership under existing legislation/regulations - Preparation and signature of LoU from scheme to District Council
3 Participatory Diagnostic Study	- Participatory analysis of opportunities and constraints, construction of problem and objective trees - Collection of supporting baseline data
4 Participatory Design/Feasibility Study	- Joint study among the scheme members, other stakeholders and specialists - Submission of results to irrigators' entity for approval/veto
5 Joint Investment Decision/ Financing Agreement	- Consideration and acceptance of positive Feasibility Report by all financiers - Preparation and signature of agreements
6 Detailed Design/Tender Documentation	- Detailed sub project design and study
7 Tendering & Contract Award	- Selection and employment of consultants following District Council procedure/regulation - Procurement of goods and works following regulations or District Council procedure/regulation
8 Implementation	- Joint effort between various actors involved, including irrigators' entity
9 Operation and Maintenance	- To be defined through Participatory Diagnostic and Feasibility Study

Source: Guidelines for Participatory Improvement to Farmer Initiated and Managed Smallholder Irrigation Schemes, July 2003

In order to fulfill these activities successfully, the ZIO/RIO needs to provide the district staff with support in close communication.

### (3) Flexible Management to Development Process

The Guidelines show the timeframe for development. According to the timeframe, two years would be required for study, design and tendering before implementation. On the other hand, the development scales of irrigation schemes cover a large range of sizes: 10 ha to 500 ha for small-scaled irrigation schemes. In addition, each irrigation scheme has a different level of maturity. Considering these points, some stages mentioned above might be skipped or the time shortened depending on the conditions of the irrigation schemes. Flexible management is needed.