Jan 2021

# Procedural Guideline for Integrated Crop Water Management Program


Government of Nepal

Ministry of Energy, Water Resources and Irrigation

Department of Water Resources and Irrigation

## Irrigation Management Division

## ACRONYMS

| | |
|---|---|
| CMP | Canal Management Plan |
| COP | Canal Operation Plan |
| DOA | Department of Agriculture |
| DPR | Detailed Project Report |
| DOWRI | Department of Water Resources and Irrigation |
| H/W | Headworks |
| ISF | Irrigation Service Fee |
| ICWM | Integrated Crop and Water Management |
| ICWMP | Integrated Crop water Management Program |
| IMD | Irrigation Management Division |
| IMO | Irrigation Management Office |
| IP | Irrigation Project |
| IS | Irrigation System |
| ISF | Irrigation Service Fee |
| MOEWRI | Ministry of Energy, Water Resources and Irrigation |
| MOU | Memorandum of Understanding |
| M&E | Monitoring and Evaluation |
| O&M | Operation and Maintenance |
| QA | Quality Assurance |
| QC | Quality Control |
| R&D | Research and Development |
| VRB | Village Road Bridge |
| WUA | Water Users Association |

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# 1. INTRODUCTION

## *1.1. Background*

The Integrated Crop Water Management (ICWM) Program introduces field level structures and activities to increase, agricultural productivity through an integrated approach of managing irrigation water as per the optimum need of crops by the farmers' water users association (WUA). It provides a complete package of modernized agriculture practices, water management techniques, and institutional support for on-farm and off-farm farming populations towards achieving optimal level of productivity. The expected achievements from the program are the better use of integrated crop water management practices to increase different crop production & productivity. The ICWM Program has three components:

i. Informative, functional data based WUA to adopt the O&M practice, irrigation system management with integrated crop & water management in an effective way.
ii. Application of on-farm water management techniques for integrated crop water requirements.
iii. Dissemination of advance agriculture technology throughout the cultivation practices.

Agriculture is still based on low-value cereal crops dominated by subsistence farming in Nepal. With insufficient irrigation water availability farming has been erratic and to a large extent dependent on monsoon rain. As a result crop production is unstable. In addition to the unavailability of year-round irrigation facility, there are other factors responsible for slow agriculture growth such as lack of effective on-farm water management, and proper drainage/subsurface drainage management practices for water use optimization, loss in soil fertility, low and unbalanced use of chemical fertilizers, unavailability of improved seeds, unscientific farming practices, limited mechanization of agriculture and difficulty in accessibility to agricultural loan and insurance facility etc. In this situation, ICWM program could play a key role to increase crop production, productivity, cropping intensity etc. contributing a sustainable irrigation system.

## *1.2. Objective of the Guideline*

This guideline aims to support/guide Irrigation Projects (IP), Irrigation Management Offices (IMO), farmers and their WUAs and all the stakeholders who are directly or indirectly responsible to plan and implement ICWM program. The key objectives of the guideline are:

- To increase knowledge and capacity of the concerned IP, IMO, and WUAs on the design, implementation and monitoring of ICWM in compliance with the guidelines, plan and working policies of the Department of Water Resources and Irrigation (DOWRI).
- To update the existing ICWM guidelines by streamlining the gaps.

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- To institutionalize ICWM in DOWRI. The Guideline may also serve as a reference document for both provincial and local governments in addressing effective & efficient ICWP practices in irrigation development works by planning cropping pattern, crop water management & increase cropping intensity through on-farm water management, drainage/sub surface drainage management for optimum utilization of available water..

### *1.3. Rationale of the ICWM Guideline*

The Irrigation Management Division (IMD), DOWRI had prepared an ICWM Program guideline. The guideline mainly focused on repair and maintenance of the irrigation systems to increase water productivity. The ICWM activities were proposed to implement only after the construction of irrigation system and was treated as a separate entity. This was negating the fundamental requirements of ICWMP to be incorporated from the initial stage of project planning, design & drawing, layout and estimation with an overall objective of sustainable irrigation development.

### *1.4. Users of this Guideline*

The primary users of the guideline will be the DOWRI staff of IP/IMO, farmers and their WUAs of all the three tiers of federal government; and for students and researchers as an academic source book for sustainable irrigation management.

## 2. PREREQUISITE FOR ICWM MAINSTREAMING IN IRRIGATION SYSTEM

In order to implement the ICWM activities at field level, there are certain prerequisites that have to be fulfilled before the implementation of the program.

- Existence of WUA (formal/semiformal/informal).
- Availability of irrigation structures for water delivery up to the targeted command area.
- Irrigation water availability to the targeted command area.

## 3. OBJECTIVES OF THE ICWM PROGRAM

The main objective of ICWM program is to increase agricultural productivity and cropping intensity through rational and planned use of irrigation water in accordance with integrated crop water requirements. Others specific objectives are:

- Assure improved irrigation service and irrigation efficiency with the use of on-farm level infrastructures.
- Institutionalize ICWM in WUA's working procedures.
- Improve the performance of irrigation system by effective and organized O&M plan.

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- In addition to the technical requirement of H/W, canal network, and drainage structures in irrigation systems, also ensure incorporate new/improved field-level water courses with on-farm water management plan from the planning stage of an irrigation system.

To achieve these objectives, the ICWM has given priority for improved irrigation facilities up to farm level, develop appropriate technology for irrigated areas including adequate and reliable supply of irrigation water.

## 4. STRATEGY OF THE ICWM PROGRAM

To achieve the above-said objectives, IMD/DOWRI has planned to follow the following working strategies:

- Incorporate ICWM plan from the beginning of the planning of irrigation system/ projects.
- Identify, select the site, plan and implement the participatory ICWM program in the irrigation system/projects in which ICWM plan has not been planned and/or implemented.
- Make WUAs informed, responsible and accountable by facilitating them to water-use database, and operate themselves as a focal for program formulation, implementation and monitoring under ICWM program.
- Disseminate improved agricultural practices, water management activities, institutionalization activities in an integrated approach from the very beginning of cultivation of particular crop in the field..
- Support and enhance the farmer's capacity in forming self-reliant WUA with knowledge on integrated irrigation and agricultural practices.
- Support in decision-making in timely maintenance of the irrigation structures for smooth operation of the system.
- Construct/rehabilitate the on-farm structures following the ICWM program.
- Prepare adoptive applied research to assist in efficient and effective functioning of the irrigation systems.
- Establish coordination and cooperation among different stakeholders like the Department of Agriculture (DOA) for designing a well functional and crop-based ICWM program.

## 5. PLANNING AND PROGRAM IMPLEMENTATION MODALITY

### *5.1. Program Planning*

The planning of ICWM starts at planning phase of the construction/rehabilitation of the irrigation system. In program planning covers:

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- The ICWM planning should be formulated in close co-ordination with farmers and WUA.
- Determine the Water availability at the source in different seasons in the system. For this purpose measure the available water at source, in canal and also collect the hydrological/metrological data's regularly to plan crop-water budget.
- Determine the types of main/alternate crops to be grown considering water availability in the command area with the coordination of farmers, WUA according to the system.
- Preparation of the list of required structures to be constructed/rehabilitated and maintained for the effective operation of the irrigation system.

### *5.1.1. Annual Crop and Water Management Plan*

Following points should be clearly identified while preparing Annual Crop and Water Management Plan:

- Main and alternate crops, cropping pattern, crop calendar.
- Irrigation methods applied up to the field level.
- Irrigation water requirement to different crop stages and irrigation intervals.
- The amount of water in each irrigation interval (by measuring amount of water). Identify the shortcomings and suggest the improvements that can be incorporated. For example, when to irrigate? How to irrigate? And how much to irrigate? The data on the availability of irrigation water will help farmer to select the suitable crops to cultivate.

The *Water Management Plan* along with *Canal Operation Schedule* should be prepared to allocate available irrigation water into the head-middle-tail portion in accordance with crop water requirement. The IP/IMO should prepare the program to train the farmers on ICWM i.e. extent of irrigation in different crops, stages, amount of water and irrigation methods. The *Farmer's Demonstration Trial* or any other suitable method can be utilized to train the farmers on following the ICWM. It is the responsibility of IP/IMO to assist WUA in the formulation of canal operation and maintenance plan. Coordinate with DOA, related offices and WUA for planning of crop type suitable to the water availability.

Hydrological/Metrological data and available water measurement in the system plays key role in water management plan. All the activities in crop management and water management should be clearly recorded to determine the consumptive use of water. The crop water requirements of different crops at critical stages of the crops are given in *Annex 1.*

### *5.1.2. Institutional Strengthening Plan of WUA*

The institutional strengthening plan of WUA mainly focuses on making WUA capable for data collection, record keeping, data analysis, resource generation, mobilization, functional coordination with different stakeholders and participation in planning, operation and maintenance of irrigation systems.

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## 5.2. *Program Implementation*

The implementation of the plan will be done by IP/IMO with close coordination of WUA. The program will be implemented as construction of on-farm structures, strengthening of WUA, capacity enhancing of IP/IMO and monitoring and evaluation.

### 5.2.1. *Working Procedure of Construction of On-farm Infrastructure*

The construction/rehabilitation of on-farm infrastructure in irrigation system is necessary at field level for proper water management with reference to water availability and crop type.

The ICWM activities shall be incorporated from the beginning of the planning of irrigation system / projects. The plan, design, drawing, layout, estimate of the on-farm structures shall be included in the detailed project report (DPR) of new irrigation projects. The plan, design, drawing, layout, estimate for ICWM program shall be prepared by the concerned IP/IMO in the irrigation systems or projects where the ICWM program has not been formulated the design, drawing and estimate for the construction of on-farm structures shall be done according to the concurrence from the IMD/DOWRI. The construction work shall be implemented through WUA with participation as indicated in the Irrigation Policy 2070 BS.

The following shall be the procedure to implement the construction and rehabilitation of on-farm infrastructures.

- The baseline information shall be collected with joint walkthrough by IP/IMO and WUA. The Log-form, which is included in *Annex 2,* should be filled indicating present situation and proposed measures.
- The plan, design, drawing, layout, estimation and approval of the construction/rehabilitation of the on farm structures shall be carried out.
- The construction/rehabilitation works shall be completed through WUA by signing an Agreement (MOU) which is included in *Annex 3*. The monitoring and evaluation of the construction/rehabilitation work shall be done jointly by IP/IMO and WUA.
- The payment shall be made according to prevalent Public Procurement Act and Regulation of Nepal. The community participation work shall also be recorded separately. The details of the expenditure to the program shall be documented properly by the WUA.
- On-farm infrastructure means small structures in field level which are necessary for water distribution, drainage and management activities such as division boxes, small cross drainage works, water measurement structures, field channels, water courses, small pipe structures, small drop structures, and other essential small on-farm structures.

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- The maintenance of headwork, main canal, branch canal, head regulator, cross regulator, main drain crossing, syphon, aqueduct, village road bridge (VRB), lining in bigger section etc. will not be applicable under the scope of ICWM program.
- This type of construction/rehabilitation work for on-farm infrastructure shall be carried out only once under ICWM program.
- Work Acceptance/Completion Certificate shall be signed by IP/IMO and WUA after completion of the construction as per the agreement. The sample of Work Acceptance/Completion Certificate of Construction Works is provided in *Annex 4*.

### *5.2.2. Technical Training*

The main objective of the technical training is to transfer the technology and process to the IP, IMO and WUA/farmers to formulate and implement the ICWM Program. The WUA will be supported for the preparation and implementation of proper crop and water management, canal O&M, system management annual action plan etc. so that they will be able to independently execute these works afterwards. The training will also seek active involvement of stakeholders including Department of Agriculture and its subordinate offices, whichever is feasible.

### *5.2.3. Institutional Strengthening*

The WUA acts as a pivot for planning and implementing the ICWM activities. Therefore institutional strengthening of WUA is a must. The institutional strengthening plan will be developed based on the baseline status of the WUAs. The approach for institutional strengthening will be as follows:

- Theoretical and field-based hands-on training for institutional and technical capacity building of WUA.
- To strengthen legal status of WUA in compliance with acts, rules and regulation.
- Formulation of the specific plan, design, estimates for construction of on-farm structures, O&M plan and their execution.
- Develop linkage with institutions providing support in the area of irrigated agriculture, organizational improvement with material and logistic support, effective system of internal resource generation as well as establishing functional linkage with multiple value-chain stakeholders to upkeep the system operational, especially during emergencies.

### *5.2.4. Monitoring and Evaluation*

Monitoring and evaluation is an integral part to materialize ICWM mainstreaming within IP/IMO and WUAs. The development of ICWM responsive Monitoring and Evaluation (M&E) system shall be used through information management system in which ICWM disaggregated data will be compiled. The indicators of M&E are presented in *Annex 5*.

# 6. MAIN ACTIVITIES UNDER ICWM PROGRAM IN IRRIGATION SYSTEM

The main activities of ICWM Program are as follows:

- Support WUA to make them familiarized with related data and information to implement ICWM activities.
- Facilitate WUA to maintain legally valid status.
- Support WUA to maintain clear list of beneficiaries with landholding and preparation of parcellary map.
- Support WUA to adopt water allocation, irrigation schedule, distribution and management that is based on crop water requirements.
- Support WUA for effective resource generation (ISF collection), mobilization for O&M, and maintain linkage with multiple stakeholders for operation of a sustainable irrigation system.
- Support WUA for establishing coordination and institutional linkage with various service providers, i.e. the agriculture sector, seed and input provider, marketing linkage, cooperatives and micro finance institution etc.
- Collect information and data to plan, design and develop the crop-water budget for optimization of available water in the irrigation system.
- Plan, design, drawing, cost estimate for "on-farm water management & drainage / sub-surface drainage" structures.
- Construction of on-farm structures supportive to water management& drainage/ sub-surface drainage.
- Water management activities and on-the-job training to IP, IMO and WUAs.
- Strengthen and institutional development of WUA for the adoption of irrigation schedule, integrated crop water management, and formulation of irrigation system O&M plan.
- Capacity enhancement of WUA, IP, IMO for ICWM activities.
- Carry out adoptive R&D in the irrigation systems so that the findings of the R&D could be utilized for effective and efficient irrigation system design.
- Monitoring & Evaluation of ICWM activities.
- Coordinate with concerned stakeholders like DoA as per requirement.

## 6.1. *Construction of On-farm Structures*

- Division box for proper distribution of irrigation water from the field channel, branch canals, tertiary canals etc.
- Outlets/turn outs to deliver the irrigation water into the farmer's field through field channel and water courses.
- Water measuring structures at various level of canals in an irrigation system.

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- Other site-specific small structures essential to operationalize the water management and drainage / sub-surface drainage at farmer's field level.
- Technically sufficient length/number of field channels, water courses network for efficient irrigation.
- Improvement of existing farm-level structure to support in smooth water management with proper drainage / sub-surface drainage facilities.

### 6.2. *Crop and Water Management Activities*

The following activities will be carried out for integrated crop water management;

- Obtain Cadastral Maps of the command area from Land Measurement Office of the Department of Survey.
- Delineate Irrigated Area Boundary (Parcellary Map) on Cadastral Maps.
- Prepare outlet-wise farmers list with land plot numbers (Kitta No.) and area. The format is given in *Annex 6.*
- Calibration of canal structures for water measurement.
- Regular water measurement and its record keeping at different level of structures. The sample water measurement form is presented in *Annex 7.*
- Collection of existing cropping pattern and estimation of irrigation water delivered in the system.
- Prepare possible cropping pattern as per water availability and consultation with WUA and farmers.
- Preparation of Canal Operation Plan (COP) with active participation of WUA and farmers.
- Preparation of Canal Maintenance Plan (CMP) with active participation of WUA and farmers.
- Process and procedures todetermine the Irrigation Service Fee (ISF) for O&M of the irrigation systems.

## 7. ROLES AND RESPONSIBILITIES

### 7.1. *Roles and Responsibility of MOEWRI, DOWRI, IMD*

The MOEWRI, DOWRI, IMD will monitor and evaluate the implementation of ICWM activities on regular basis.

- The MOEWRI, DOWRI, IMD will provide suggestions and recommendation for proper implementation of ICWM activities.
- The MOEWRI, DOWRI, IMD will be responsible for formulating different rules, regulations, policies and guidelines needed for efficient and effective ICWM.
- Provide necessary resources for planning and implementation of ICWMP.

- IMD will provide technical directives to the concerned IP, IMO and WUA/farmers during monitoring of work implementation (Software and Hardware training) at least once in a crop season.
- IMD will give concurrence based on the plan, design, drawing, layout, estimate and necessary information for construction/rehabilitation of on-farm structures.
- IMD will facilitate IP, IMO and WUA on need based research and development activities and other essential support for ICWM activities.
- MOEWRI, DOWRI, IMD will be responsible to make sure that the plan and implementation of ICWM activities are included in Detailed Project Report (DPR) of Irrigation projects.
- IMD will be responsible for the R&D activities in coordination with IP/IMO.

### *7.2. Roles and Responsibilities of IP/ IMO*

The IP/IMO will be responsible for undertaking following activities:

- Accountable to incorporate ICWM activities in project preparation, planning, design, drawing, layout and estimate in DPR.
- Collect, information, analyze, provide data to implement ICWM activities.
- Prepare the water management plan, design, drawing and institutional strengthening plan in the selected irrigation system.
- Prepare ICWM implementation proposal for construction/rehabilitation of on farm infrastructures with concurrence of the IMD.
- Provide feedback about the program to MOEWRI, DOWRI IMD, and other concerned stakeholders.
- Support WUAs in grooming as self-reliant institution capable for sustainable Operation and Maintenance of the system.
- Incorporate necessary suggestions and recommendations given by WUA while implementing ICWM activities.
- Forward any suggestions and recommendations related to policies, rules, regulations and guidelines to DOWRI, MOEWRI.

### *7.3. Roles and Responsibilities of WUA*

It is the responsibility of WUA to undertake the following:

- WUA will be the focal point of all ICWM activities.
- WUA will be involved in planning and implementation of crop and water management, construction/rehabilitation of on-farm irrigation structures, operation & maintenance, and monitoring & evaluation of the system.
- The WUA will give feedback and recommendation for effective implementation of ICWM.

- The WUA will construct, develop the on-farm structures after signing of MOU.
- The WUA will apply crop water management activities and O&M activities for sustainability of the irrigation system.
- The WUA will collect irrigation service fee (ISF) for O&M of the irrigation systems.

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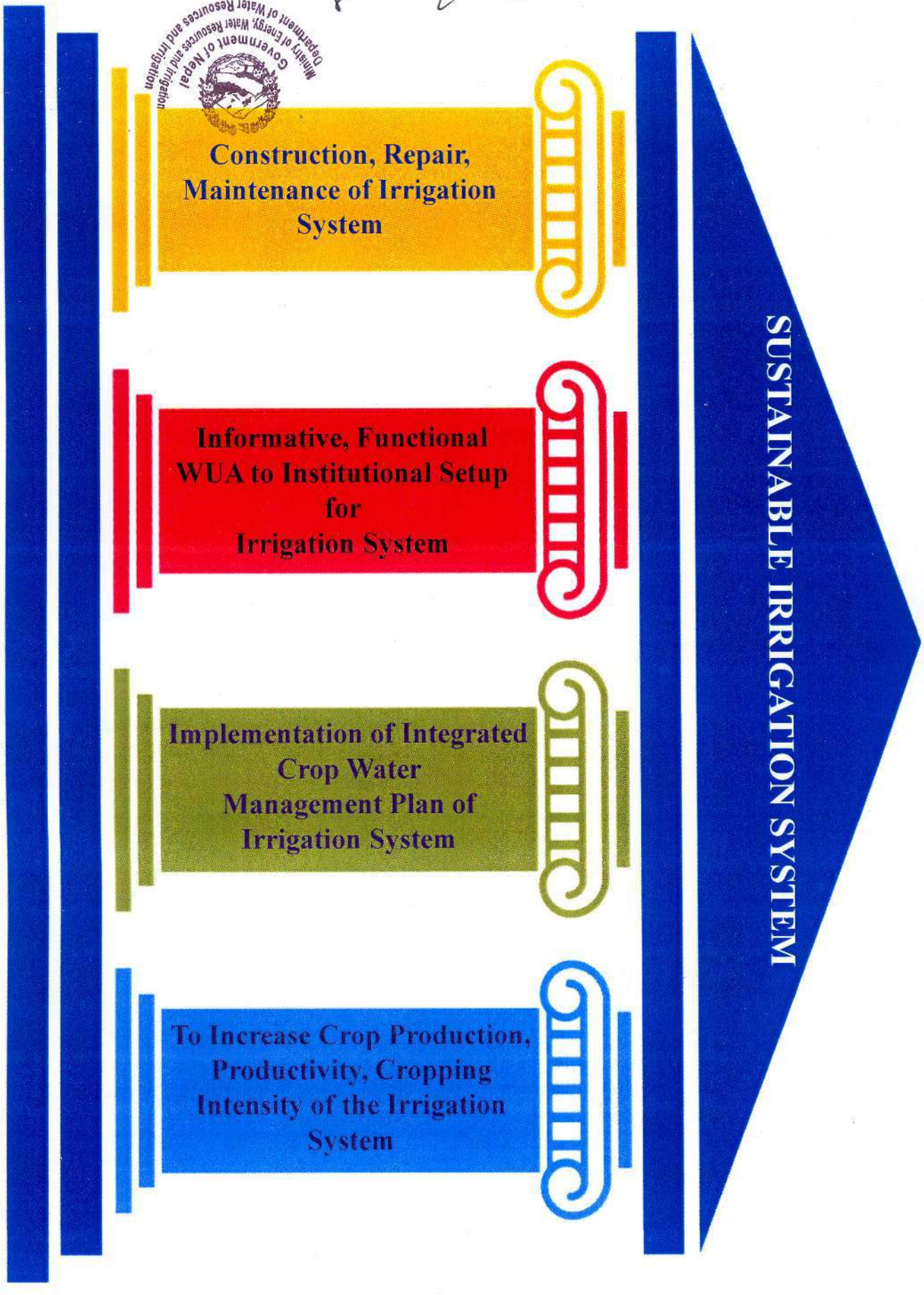
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Construction, Repair, Maintenance of Irrigation System
Informative, Functional WUA to Institutional Setup for Irrigation System
Implementation of Integrated Crop Water Management Plan of Irrigation System
To Increase Crop Production, Productivity, Cropping Intensity of the Irrigation System
SUSTAINABLE IRRIGATION SYSTEM

# Annexures

## Annex 1

## Critical Periods for Irrigation

### (A) Important Periods for Cereal Crop

| | | |
|---|---|---|
| 1. Paddy | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 900-1500 mm<br>100-120 days<br>• Crop Elongation Period<br>• Jointing Period<br>• Flowering Stage<br>• Dough stage |
| 2. Wheat | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 450-650 mm<br>110-130 days<br>• Crown Root Initiation<br>• Tillering Stage<br>• Jointing Stage<br>• Flowering Stage<br>• Dough Stage |
| 3. Maize | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 500-800 mm<br>90-120 days<br>• Knee-high Stage<br>• Tassel Formation Stage<br>• Grain Formation Stage<br>• Grain Maturity Stage |
| 4. Barley | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 450-650 mm<br>110-130 days<br>• Flowering Stage<br>• Grain Formation Stage |

### (B) Oil-seed Crop

| | | |
|---|---|---|
| 1. Mustard | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 350-450 mm<br>90-125 days<br>• Growing Stage<br>• Before Flowering Stage<br>• Pod/grain Stage |
| 2. Groundnut | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 550-600 mm<br>110-130 days<br>• Growing Stage<br>• Jointing Stage<br>• Flowering Stage<br>• Nut Formation Stage |
| 3. Sunflower | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 900-1300 mm<br>90-120 days<br>• Growing Stage<br>• Before Flowering Stage |



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## (C) Legumes Crops

| | | |
|---|---|---|
| 1.Moong | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 400-500 mm<br>90-100 days<br>• Germination Stage<br>• Flowering Stage<br>• Pod Formation stage |
| 2. Gram | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 400-550mm<br>140-145 days<br>• Branching Stage<br>• Flowering Stage<br>• Pod Formation Stage |
| 3. Pea | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 350-500mm<br>65-100 days<br>• Growing Stage<br>• Flowering Stage |
| 4. Soyabean | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 450-700 mm<br>100-120 days<br>• Growing Stage<br>• Pod Formation Stage |

## (D) Vegetable Crop

| | | |
|---|---|---|
| 1.Tomato | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 400-800 mm<br>60-90 days<br>• Plant Elongation Stage<br>• Flowering Stage |
| 2. Potato | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 500-700mm<br>100-150 days<br>• Growing Stage<br>• Tuber Shoot Formation<br>• TuberizationStage |
| 3. Raddish | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 300-400 mm<br>40-60 days<br>• Growing Stage<br>• Root Development Stage<br>• Tap Root Develop Stage |
| 4. Cauliflower | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 350-500 mm<br>55-120 days<br>• Requires frequent irrigation from planting to harvesting |
| 5. Cabbage | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 350-500mm<br>70- 90 days<br>• During head formation and enlargement |

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## (E) Industrial Crop

| | | |
|---|---|---|
| 1. Sugarcane | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 1800-2400 mm<br>300-360 days<br>• Growing Stage<br>• Tillering Stage<br>• Stem Develop Stage<br>• Node Develop Stage |
| 2. Cotton | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 700-1300 mm<br>150-180 days<br>• Growing Stage<br>• Flowering Stage<br>• No water Logging |
| 3. Jute | Average Amount of Water Reqd.<br>Average Cropping Period<br>Critical Period of Irrigation | 500-700 mm<br>110-140 days<br>• Plant Develop Stage<br>• Stem Growth Stage<br>• Flowering Stage |

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## Annex 2
## Logging Form for the construction works of on farm structures

Name of the system.....

| Chainage 0+000 | Present situation | Proposed measures | Details of proposed measures | Remarks |
|---|---|---|---|---|
| | | | | |

Signature on behalf of WUA

.....

Name:.....

Position:.....

Date:.....

Signature on behalf of the IP/IMO Office

.....

Name:.....

Position:.....

Date:.....

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# Annex3

## Agreement copy of Construction Work

SAMPLE MEMORANDUM OF AGREEMENT

BETWEEN

IRRIGATION PROJECT / IRRIGATION MANAGEMENT OFFICE

DEPARTMENT OF WATER RESOURCES & IRRIGATION

MINISTRY OF ENERGY, WATER RESOURCES & IRRIGATION

AND

..... WATER USERS ASSOCIATION

.....

PREAMBLE

The Memorandum of Agreement signed on this date of ..... at the Irrigation Project / Irrigation Management Office of ..... District, by and between Irrigation Project / Irrigation Management Office ..... District, hereinafter referred to as the "IP/IMO" and the ..... Water Users Association ..... registered with the IP/IMO on ..... in the ..... District, ..... Province, hereinafter referred to as "The WUA" have agreed upon the conditions mentioned in the following Articles.

In accordance with the "Irrigation Policy, 2070 B.S., prevailing Public Procurement Act and Regulation, 2056 B.S., both parties have entered into an agreement to operate and maintain the on farm structures by utilizing the funds allocated by the Government of Nepal and the mobilizing the people participation of the above said irrigation system, to utilize water of .....river/stream located at Ward No. ..... of .....District in ..... Municipality / Rural Municipality to construction/ rehabilitation of the "on-farm structure" in the command area of ..... ha in Ward No(s) ..... in .....Municipality / Rural Municipality DC in .....District in..... Province.

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## ARTICLE -1

### Program Objectives

1.1 The IP/IMO and the WUA shall work together to rehab/construct the new small structures at farmer's field to increase agricultural production and to promote system sustainability and enhance the livelihoods of poor men and women through the direct participation of users in operation and maintenance of the irrigation system.

1.2 IP/IMO and WUA will thoroughly discuss on the terms and conditions of work breakdown agreement between the two and include them as integral parts of the agreement. Construction and rehab work will be separated item wise for each party after detail discussion. These items are presented in the Attachment of the agreement.

1.3 The IP/IMO shall provide financial and technical assistance as required and as requested by the WUA.

1.4 The responsibility of operation and maintenance of the "on-farm structure" after completion of construction/rehabilitation work shall remain with the WUA. However, repair works that are beyond the capacity of WUA and classified as major repairs shall be carried out through joint financial & technical cooperation.

1.5 If major damage occurs due to natural disaster then IP/IMO shall repair the facility in cooperation with WUA. But, if the damage was due to users' negligence then WUA shall take the sole responsibility of the repair work

## ARTICLE – 2

### Responsibilities of the IP/IMO

2.1 The IP / IMO shall conduct field surveys with direct cooperation of water users, prepare design and cost estimates and discuss these with the WUA members prior to the start of construction / rehabilitation of the "on-farm structure".

2.2 The IP/IMO after consultation with the WUA shall prepare detailed designs and cost estimates regarding the construction and show to the WUA at the time of agreement.

2.3 IP/IMO shall bear 75 % of the estimated cost of construction/rehabilitation work.

2.4 The IP/IMO shall have the right to enter into the construction site or house and land in connection with the construction/extension of the irrigation system.

2.5 The IP/IMO shall provide necessary technical input during the construction/rehabilitation of the work. It shall inspect the stock of construction materials and/or equipment if these items were obtained from IP/IMO by the WUA representatives. The WUA shall take full responsibility for QA/QC of the construction/rehabilitation works.

2.6 IP/IMO shall organize training courses to the selected farmers to make them capable of managing, operating and maintaining the irrigation facility. It shall also coordinate training on other issues related to irrigated agriculture.

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## ARTICLE – 3

## Responsibilities of the WUA

3.1 WUA shall fulfill its share of work or contribution in time as per conditions laid in the agreement. The WUA shall confirm its agreement to extend irrigation water to all its members without any discrimination of sex, caste, religion or ethnicity. All the households within the command area and its influence area will be regarded as WUA member community.

3.2 The operation and maintenance of the "on-farm structure" lies with WUA after the completion of the above mentioned work.

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## ARTICLE - 4

## Description of Construction

(Bill of Quantity)

| S.N. | Description of Work | Quantity | Amount NRs. | GoN Contribution NRs. | Farmers Contribution NRs. | Remarks |
|---|---|---|---|---|---|---|
| | | | | | | |
| Grand Total NRs | | | | | | |

Grand Total in Words : .....

Signature on behalf of the WUA

.....

Chairperson

.....water users association

Seal of WUA Office

Witness

1. .....
2. .....

Signature on behalf of the IP/IMO

.....

Chief of IP/IMO

Irrigation Project/Irrigation Management

Seal of IP/IMO office

Witness

1. .....
2. .....

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# Annex 4
## Work Acceptance/Completion Certificate of Construction Works

We certify by the undersigned personnel that the rehabilitation and maintenance work of the following on farm structures of ..... irrigation system has been completed according to Engineering norms and general principles, as agreed between Irrigation Project / Irrigation Management Office and the concerned WUA on dated ..... and will take full responsibility of operation and maintenance of the system as written in the agreement.

**Details of the Construction Work**

| S.N. | Details of Works | Total Expenditure | Exp. By GON | People Participation | Remarks |
|---|---|---|---|---|---|
| | | | | | |
| | Total | | | | |

Signature on behalf of the WUA

.....

**Chairperson**

.....Water Users Association
Seal of WUA Office

Witness

1. .....
2. .....

Signature on behalf of the IP/IMO

.....

**Chief of IP/IMO**

Irrigation Project/Irrigation Management
Seal of IP/IMO office

Witness

1. .....
2. .....

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# Annex 5
# Indicators of Monitoring and Evaluation

## (A) For Crop Production

| S.N. | Particulars | Before Implementation | After Ist year of Implementation | After IInd year of Implementation | Remarks |
|---|---|---|---|---|---|
| 1 | Cropping Intensity | | | | |
| 2 | Crop Diversification | | | | |
| 3 | Crop Productivity | | | | |

Note: Fill up the Productivity of each crop separately

## (B) For Water Management

| S.N. | Particulars | Before Implementation | After 1st year of Implementation | After 2nd year of Implementation | Remarks |
|---|---|---|---|---|---|
| 1 | Available Water Quantity | | | | |
| 2 | Equitable water distribution | | | | |
| 3 | Availability of water according to crop | | | | |
| 4 | Irrigation Efficiency | | | | |

## (C) For Institutional Development of WUA

| S.N. | Particulars | Before Implementation | After 1st year of Implementation | After 2nd year of Implementation | Remarks |
|---|---|---|---|---|---|
| 1 | Regular meeting & status of implementation of the decisions | | | | |
| 2 | ISF & Resource Collection and Mobilization | | | | |
| 3 | Good governance | | | | |

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# Annex 6
## Information for Parcellary Map

Date .....

District: .....

Irrigation System Name: .....

Main/Branch/Tertiary Canal Name: .....

Name of the Outlet & Chainage: .....

Rural Municipality/ Municipality Name & Ward No: .....

| S. No. | Farmers Name | Address | Plot No. ( Kitta No.) | Plot Area Ro – Aa – Paisa Bi --- Kattha --- Dhur | Plot Address | Remarks |
|---|---|---|---|---|---|---|
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# Annex7
# Water Measurement Form

1. Name of the Irrigation System:.....

2. Location

   (A) Rural Municipality/Municipality

   (B) Ward no.

   (C) District

3. Command Area of the system.....

4. Potential Irrigated Area:

   (A) Monsoon

   (B) Winter

   (C) Summer

5. Places for Water Measurement

   (A) System Level (Main Canal/ Branch Canal/Tertiary Canal/Water Control Structures) Outlet.

   (B) Field Level (irrigation intervals according stages of crop).

   (C) Hydrological/Metrological data.

6. Date of water measurement.....

7. Frequency of measurement (Daily, Weekly, Fortnightly, Monthly etc.)

8. Methods of Water Measurement:

   (Float Method, Current Meter, Flume, V-notch, others).

9. Discharge

   (A) System Level

   a.....

   b.....

   c.....

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Average Discharge....

(B) Field Level

Discharge and Time for irrigation applied;

a.....

b.....

c.....

Average Discharge and Time for irrigation applied..

10 Is water measurement utilized for the purpose of water management ?

11. If yes, in which stages?

12. Is availability of water measured, sufficient for that seasonal crop ?

If not; what percentage less?

13. How do you manage insufficient discharge ?

14. Is water measurement helpful in water management activity?

15 Is there any problems faced during measuring water (flow)?

If yes; what are they?

16 What is the method applied for the distribution of water according to available discharge?

(A) Rotation

(B) Continuous

(C) Mixed

17 Is required amount of water available in the canal on the basis of water measurement?

18 Rainfall during crop season

(A) Rainfall Measurement

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(B) What is effect of rainfall in cropping season?

19 What are the possibilities of water loss from the field after irrigation applied? What are solutions applied to minimize these losses by identifying and measuring? What is the effect in utilizing the irrigation water?

20. If, any suggestion?

21 Name of the measuring person:

Position:

Signature