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MINISTRY OF AGRICULTURE

National Irrigation Development Extension Implementation Guidline

June, 2019

Addis Ababa

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Prepared by the Collaboration of Small Scale Irrigation Development Directorate & Agricultural Extension Directorate

First Edition

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About this Edition:

This guideline is the first edition designed to meet the technical need of Ethiopian irrigation experts and IDAs that are working in the area of irrigation development &water toestablishing and ensuring irrigation extension services for smallholder and medium scale irrigation users.

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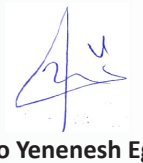
MESSAGE

In last near few years, the government of Ethiopia set strategy of small scale irrigation drainage (2019), and others particularly; agricultural & Rural development policy and strategy (2003), the agricultural policy & investment (2009), and the strategy of Climate Resilience Green Economy /CRGE/(2013), improve the production & productivity of irrigation development, food security, transfer small scale farmers to market lead & high value crop production and also produce agricultural production based on the climate smart agriculture are few of them. To achieve this strategy, the government lay down a short & long term plan to have one water source bank for each farmers. According to this plan, the potential of irrigable land is about 11 million hectare and the farmer can will have averagely 0.3ha irrigated land and approximately 30 million farmers can will be served in the country. Therefore, to address this strategy, the ministry of agriculture set different programs and projects to build irrigation schemes and establish rules and guidelines to be applicable by the farmers and users. The ministry set a guideline to address assessment of irrigation needs, design study, construction and monitoring, water utilization, different irrigation technologies and new applications, irrigation development strategies and adoption, and so that tried to set an irrigation development service delivery guideline

Thus, to address all above mentioned things a guideline is needed to handle all stakeholders and utilizes through using irrigation development extension particularly on small & large scale irrigation to establish and strengthen the existed IWUA, to manage and to make sustainable irrigation development should be achieved by giving advisory service and to give training for farmers and can will be improve irrigation production & productivity, to make modernize market linkage, to practice new irrigation technologies, to improve irrigation development input supply, to strengthen the beneficiaries knowledge & skill , and to identify and disseminate best practice .

On formulating this guideline the participation & integration between Federal, regional and other stakeholders were been strong. Though, based on the market oriented extension strategy, this irrigation development extension guideline helps more for market demanded irrigation products, to validate watershed based green economy development, to choose & utilize appropriate irrigation technology, to participate women's & youth in irrigation development, to formulate irrigation commodity clustered approach and to make market oriented participatory extension in general.

Finally, I remind you that, all stake holders should committed to embrace human and natural resource (land, water and labour) to address for irrigation users through using this irrigation extension guideline.



W/o Yenenesh Egu

Director, Agricultural Extension Directorate

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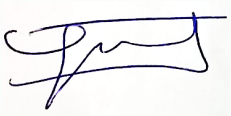
The preparation of this document, “National Irrigation Extension Guideline’’ is a paramount importance to explore effective irrigation extension strategies in Ethiopia. It is prepared for all Irrigation-Extension Experts and Irrigation Development Agents used for effectiveness of an irrigation extension system on how the water users are deriving extension information for adoption of improved irrigation technologies, input supply and market linkage, service delivery system and package development throughout all irrigation seasons. Small-scale irrigation expansion directorate in Ministry of Agriculture and Livestock resources aspires to see sustainable irrigation system for all smallholder irrigation water users and implementers to increase the productivity of irrigated agriculture that is realistic with best irrigation extension approach.

I therefore, would like to acknowledge the support of regional Bureaus of Agriculture (BoA) of Amhara, SNNP, Tigray and Oromia Irrigation Development Authority (OIDA), appreciate efforts, and recognize the team of expertise and team members indebted from all regional and national expertise contribution for the successful implementation of this first edition of national irrigation extension guideline in all dimensions. We would like to extend our appreciation and thanks to all contributors and editors for their support in developing and editing of these very important training manuals. Moreover, sincere regards and thanks, goes to the Small Scale and Micro Irrigation Support (SMIS) project for its technical and financial support in developing this training manual through organizing write shop for team of experts and review and validation workshop for federal and regional partner institutions.

Finally, we acknowledge the support of the Kingdom of the Netherlands and the Government of Canada in providing financial and technical support through the SMIS project for all capacity development works particularly for preparation of first edition of “National irrigation extension guideline’’.



Elias AWOL

Director, Small Scale Irrigation Development Directorate

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PREFACE

This extension guideline is presented in nine chapters. The first chapter deals with a general concept of irrigation extension system and clearly understands the definition of irrigation extension, principles and importance. The second chapter deals with participatory approaches of irrigation system, third chapter presents institution support and coordination system and also the fourth describes on selection of irrigation extension system and how to recorded innovation results. The fifth chapter describes about implementers of irrigation extension expertise (IDA's) and six deals with method of planning irrigation extension. On the seventh topic extensions, know how to develop crop value chains for creating market opportunities and increase productions system.

Finally, on chapter eight the guideline tells the procedures on method of training preparation and need assessment by irrigation extension expertise and finally on the last chapter extension expertise knows how irrigation extension can monitor, evaluate and select appropriate learning tools for irrigation water users.

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ABBREVIATIONS AND ACRONYMS

ADPLAC	Agricultural Development Partners Linkage Advisory Council
AISE	Agriculture Inputs Supply Enterprise
AISMP	Agriculture Inputs Supply and Marketing Process
ATA	Agricultural Transformation Agency
AWP	Annual Work Plan
AIOMP	Agricultural Inputs & Outputs Marketing Process
BoA	Bureau of Agriculture
BoWRD	Bureau of Water Resources Development
CPA	Cooperative Promotion Agency
CPP	Cooperative Promotion Process
DA	Development Agent
ESE	Ethiopian Seed Enterprise
FAO	Food and Agriculture Organization
FFG	Farmer Focus Group
FFS	Farmers Field School
FINA	Farmer Information Needs Assessment
FTC	Farmers Training Center
ICT	Information Communication Technology
IDA	Irrigation Development Agent
IAEP	Irrigation Extension Process
IMC	Irrigation Management Committee (in Woreda)
ISC	Irrigation Service Coordination (sub-platform of ADPLAC)
IWUA	Irrigation water users Association
IWUG	Irrigation water users Group
JES	Job-Embedded Support
KAP	Knowledge, Attitude and Practice
MI	Micro Irrigation
NGO	Non-Governmental Organizations
NRMP	Natural Resource Management Process
O&M	Operation & Maintenance
PIDM	Participatory Irrigation Development Management
PRA	Participatory Rural Appraisal
PTD	Participatory Technology Development
REF	Research Extension Farmer (is linkage)
SMIS	Small-Scale and Micro Irrigation Project
SMS	Subject-Matter Specialist
SSI	Small-Scale Irrigation
SWHISA	Sustainable Water Harvesting and Institutional Strengthening in Amhara
TNA	Training Needs Assessment
WoARD	Woreda Office of Agriculture and Rural Development
WUINA	Irrigation water user Information Needs Assessment

KEYWORDS

This guideline utilizes the following definition of terms:

- **Irrigation Development:-** Irrigation can be broadly defined as the practice of applying additional water (beyond what is available from rainfall) to soil to enable or enhance plant growth and yield, and,in some cases, the quality of foliage or harvested plant parts. The water source could be ground water pumped to the surface, or surface water diverted from one position on the land scape to another.

- **Modern Irrigation:-** Irrigation modernization is a process of technical and managerial upgrading (as opposed to mere rehabilitation) of irrigation schemes combined with institutional reforms, with the objective to improve resource utilization (labour, water, economic, environmental) and water delivery service to farms

- **Smallholder Irrigation:** irrigation farms operated at the household or community level on different small-scale irrigation projects or dedicated even in some medium scale and large-scale irrigation schemes that can be owned by small holder farmers. The description “small-scale” refers not so much to the physical size of the farm plot or theirrigation scheme or system (although these are usually small), but rather to the fact that theplots and the irrigation schemes (where a scheme is present) are managed and owned by thefarmers themselves. It is this which distinguishes SSI from medium and large-scale irrigation,and from commercial irrigation, in which a public or private entity is responsible for themanagement of the irrigation scheme, even if smallholder farmers are the irrigators andproducers.

- **Irrigation Water User or water users:-** is an a non-profit organization for irrigation water management made up of a group of small and large-scale irrigation water users along one or more hydrological sub-systems (distributory canals which are the higher level than a watercourse) regardless of the type of farms involved, such as irrigators, who pool their financial, technical, material, and human resources for operation and maintenance of a local water system or irrigation schemes. By water

users we mean the ordinary cultivators of land, individual members of lease-holding farms and shirkats, owners of private and dehkan farms, owners of home garden plots, etc. These are the potential members of the WUA, who pool financial, material, technical and human resources for the operation and maintenance of the irrigation and drainage system within their jurisdiction for the benefit of all the members.

- **Small halder farmers land property:-**mean any one either an individual or group who have small plot of land property that used for irrigation development.

- **IDA:-** is an agricultural development consultant and engaged in the development of irrigation water and irrigation schemes, through strengthening irrigation water supply chain, increasing input supply, linking research-extension-farmers and pastoralist relationships with institutional support services and providing professional support for irrigation development. This may be a qualified and/or experienced professionals, for example, trained in the field of irrigation or a temporary/ professional trainee.

- **Cluster Irrigation Development Land Team:-** Those irrigation land holders may be 3-5 farmers who are used a common secondary, thershiry or above level cannal used on their farm land and have one group leader.

- **Cluster Irrigation Development Land Group:-** A group those who have 3-5 Cluster Irrigation Development Land Teams who are used a common secondary, thershiry or above level cannal, inputs , markete and who are solve irrigation chalenges by discati

CHAPTER - 1

IRRIGATION DEVELOPMENT IN ETHIOPIA

1.1 Introduction

The development of irrigation and agricultural water management holds significant potential to improve productivity and reduce vulnerability to climactic volatility in any country. Although Ethiopia has abundant rainfall and water resources, its agricultural system does not yet fully benefit from the technologies of water management and irrigation. The majority of rural dwellers in Ethiopia are among the poorest in the country, with limited access to agricultural technology, limited irrigation extension system, limited possibilities to diversify agricultural production given underdeveloped rural infrastructure, and little to no access to, credit access, agricultural markets and to technological innovations. These issues, combined with increasing degradation of the natural resource base, especially in the highlands, aggravate the incidence of poverty and food insecurity in rural areas. Improved water management for agriculture has many potential benefits in efforts to reduce vulnerability and improve productivity. Due to this the policy set an individual farmer to have one access of water source. The government tried to solve the credit access and market conditions which embraced in irrigation extension due to the improvement of irrigation area particularly the SSI. In addition to these, delivery of technological package that includes soil type, access to water schedule with considered and give priority to support market access increase the irrigation development.

The problem of food insecurity frequently occurred due to the agricultural production depend on rain fed agriculture and also irrigation development and rain fed agriculture didn't coincide and integrate each other. In all areas and time of water scarcity where irrigation development coincide with farm expansion, could achieve food security, increase farmers income, improve export market and a lot of job opportunities opened due to implementation value chain of irrigation activities

Effective irrigation development scheme implementation depends on willingness of water users, strong WUA, well organized and developed agricultural

input supply, strong research-extension- farmers linkage, strong linkage of stakeholders who engaged on irrigation. These be evidence for good conduct of participatory irrigation extension approach convince small holder farmers to use improved agricultural technologies

To achieve sustainable development, the government prepared capacity building strategies of SSI development in current development agenda to improve the capacity of small holder farmers. As stated on the strategies direction number 2, strengthen the irrigation water and crop management on farm. These include improve of knowledge and skill of farmers on implementation of construction and maintenance of schemes, management of crop and water in the field of small scale irrigation

In giving priority to support achievement of food security, the MoA prepared a SSI strategic document on 2018 that will be applied on the use of farmers potential and skill in use of small scale irrigation. The guideline of irrigation development extension service puts key activities and ideas regarding on training on capacity building of irrigation expertise and development agents.

This guideline organized based on the nine pillars stated in national agricultural extension strategies; and the main aim is to capacitate regional, zonal, woreda and the irrigation development agents who have responsibility on development of irrigation schemes that helps irrigation extension workers to have good knowledge and skill to deliver good advice, training and support to those communities who are engaged on irrigation development

The extension strategy document mainly used for irrigation extension expertise to increase the production and productivity, income and then improve livelihood of SSI beneficiaries by using in delivery of extension services and skill for the development of new concepts, well systematic and changed or developed irrigation extension service

On the features of this irrigation development extension guideline; include and clearly underline the participatory delivery and extension communication methods as well as the roll of IDA how to transfer improved irrigation technologies to farmers. Although, the document encompass training and monitoring activities should be implemented by woreda irrigation expertise.

In general, the irrigation development expertise and IDA should understand

how to beneficiaries develop irrigation effectively through use of participatory irrigation development extension method and improved irrigation technologies. The guide line can be improved in futures including field experience, trained and new innovation obtained from research.

1.2 The current Ethiopian irrigation development extension analysis

The existed irrigable land estimated about 11.1 million ha in Ethiopia. However, currently in different levels existed irrigated land are not more than 2 million ha. and as a result, the Ethiopian average rate of irrigation development for the last 12 years was about 1,090-1,150 ha/year[12]. The average farm size per household is 0.5 ha and the irrigated land per households' ranges from 0.25 - 0.5 ha in the Ethiopian context. Most of the traditional and modern irrigation land operated by IWUA's along IDA's and DA's existed at kebele level. However, the IDA's that who have provide advice regarding irrigation development extension service are not more than 1% from all DA's existed in the country, and thus, the cultivated irrigated land didn't registered consistently using technologies. The major constraints hindering irrigation developments are predominantly primitive nature of the overall existing production system; shortage of adequate agricultural inputs and limited improved irrigation technologies; limited trained human power; inadequate extension services; inadequate availability of potential and skill in the sector; inadequate provision of irrigation development extension service; and heavy capital requirement are some of them.

Therefore, it is essential and necessary to make national irrigation development extension execution guideline to improve the knowledge and skill of IDA with irrigation development extension in our country to solve the challenges of human resource development, level and type of irrigation technology system, irrigation development infrastructure, linkage of irrigation development organization strategies, irrigation research system, multiplication of irrigation technologies through use of irrigation extension in country.

1 (MoA,2011)::
2 (Nata et al.,2008; Bekele et al., 2012)

1.3 Success & Gaps in the Irrigation Develoment extension

The national irrigation development extension service did not developed well and the practices are not differ from rain fed agriculture. Most of well developed irrigation development extension exists on those who have proximity to market, road access, well access and use of irrigation technology areas. These areas improved due to market demanded products in addition to IDA and irrigation professionals support. The irrigation development and good livelihood of community encourages on observed in those who used few constructed modern irrigation and communities that their livelihood depend on traditional irrigation users

On the other hand, most of the existed DA gave extension service, monitoring and support for those farmers who are based on the rain fed agriculture rather than on using irrigation in right way. This is becouse of mainly due to organizational problem; for instance, on those regions who has established irrigation development authority structure at reginal level, they strech the structure to woreda as a result on those regions the woreda expertise have got better salary than agricultural office and the DA exist in kebele level. Thus, the DA's didn't accept what the woreda irrigation advised, becouse the DA's are under the Woreda agricultural office, and resulted un efficient integration and collaboration between agricultural office and irrigation development authority. In addition to these, the delivery of service by kebele DA imposed to be dormant due to lacks of moral, motivation, supply of agricultural input, monitoring and support of farmers, and market linkage service. The FTC also hasn't deliver full service to farmers in supporting knowledge, awareness, skill including in those kebeles who have potential irrigation schemes

1.4 Opportunities and Chalengs in delivery of irrigation development extension

Challenges and opportunities of irrigation development in Ethiopia emphasized on the report documents of Ministry of Ethiopian Water and Energy[3] (The MoA,2011) and Ministry of Agriculture[4] (2011a)4

1.4.1. Opportunities in delivery of irrigation development extension

The government of Ethiopia set irrigation development in the policy and strategy that being operated in GTP. In addition to these, farmers indigenous knowledge, introduced of rain water harvesting mechanisms and existing use of SSI, the existence of government political commitment and decision, the establishment of system that encourage private and investors, exist of ample water source, exist of favorable environment, exist of ample labor, and exist of plenty of irrigable land particularly in low land of the country that can make the irrigation extension effective .

1.4.2. Chalengs in delivery of irrigation development extension

Technical and knowledge gaps are the major challenges observed in different evaluation taken on the small scale irrigation development in our country. These are :- (1) inadequate awareness of irrigation water management as in irrigation scheduling techniques, water saving irrigation technologies, water measurement techniques, operation and maintenance of irrigation facilities, (2) inadequate knowledge on improved and diversified irrigation agronomic practices, (3) shortage of basic technical knowledge on irrigation pumps, drip irrigation system, sprinkler irrigations, surface and spate irrigation methods (4) scheme based approach rather than area/catchments based approach for the development of SSI Schemes, (5) inadequate baseline data and information on the development of water resources, (6) lack of experience in design, construction and supervision of quality irrigation projects, (7) low productivity of existing irrigation schemes, (8) inadequate community involvement and consultation in scheme planning, construction and implementation of irrigation development, (9) poor economic background of users for irrigation infrastructure development, to access irrigation technologies and agricultural inputs, where the price increment is not affordable to farmers,and (10) lack of cool storage, market chain and inaducate information for production are some constriants.

1.5 Objective

The aim of this guideline is to give implementable advice and information to those irrigation expertise and beneficiary farmers engaged on irrigation development activities, regarding how to improve the utilization of irrigation water and then increase the productivity that helps to improve their income in participatory way

1.6. The benefit of irrigation development extension service execution guideline

Through participatory method of irrigation extension approach, convince small holder farmers to implement irrigation development activities based on participatory way; to strength beneficiaries in irrigation water association; to improve the supply of input and utilization, integration of stakeholders support service with embrace the link between research-extension-farmers, based on the natural resource conservation provide new irrigation technologies to make modern irrigation in those effective irrigation scheme; it helps to strength the crop production development and then improve the products for consumption, industries and export. Thus, the use of irrigation development extension:-

- ⇨ Increase production
- ⇨ Irrigation development based on natural resource conservation helps to decrease the pollution and soil erosion
- ⇨ Improve the efficiency of input, water, labour and resource utilization of beneficiaries
- ⇨ Decrease the threats and loss of business due the delivery of irrigation service.

  Improve sustainability and participatory irrigation development service.

1.7 The purpose of irrigation development extension execution guideline

The purpose of this irrigation development extension execution guideline helps to guide the irrigation development expertise , DA's and farmers to provide of

technical knowledge and information to apply appropriate plan, execution, and follow-up the national irrigation development to make similar in all regions and implement in sustainable manner; and intended to boost up water utilization as a result improve the livelihood of farmers. Thus, this irrigation development extension execution guideline incorporates irrigation development extension features, principles and the way of technology selection, institutional support, coordination and linkage, method of communication, the role & execution of irrigation development agents, target of executed irrigation development activities, supply of irrigation products to market in value chain, ,identifying training needs and set up plan, and Monitoring & evaluation, and identify best fit practice in irrigation development extension are some of the components embraced in this guideline.

This execution guideline elaborates & include the features, method of participatory approach and the way of communication to farmers. The guideline involved the role of irrigation development agents and how to transfer improved irrigation technologies for farmers along irrigation water utilization and management system. This document notes that training and continuous follow up should be given to farmers to address efficient utilization of irrigation water for users through woreda irrigation development agents.

1.8 Scope

This execution guideline serves to all farmers, expertise, GO's & NGO's stake holders who are engaged on irrigation development. The service of irrigation development extension, method of monitoring and evaluation included in this guideline are based on profession.

1.9 Principles of Irrigation Development Extension

The basic goal of irrigation development extension focus on sustainable growth of social and economic livelihood of farmers. Thus, irrigation development extension has the following its own key principles:-

- ⇨ Organize and distribute new improved irrigation development information & technologies.
- ⇨ Provide training to improve the farmers knowledge, skill and attitude.
- ⇨ Strength market linkage & improve value chain

- ⇨ Incorporate gender & youth mainstreaming, nutritional food system in irrigation development.
- ⇨ Improve sustainable environmental conservation.
- ⇨ Improve organizational integration and linkage.
- ⇨ Strength developmental stakeholders, human resource development and delivery of effective irrigation development extension services.
- ⇨ Execute strong monitoring & evaluation based on effectiveness
- ⇨ Organize best fit practice of irrigation development and others are embraced in. The principles of irrigation extension development are similar to that of agricultural extension principles and have the following main components-

1. ***Principle of interest and need based on watershed and develop operational schedule:-*** The IDA should identify the famers needs and organize the operational schedule of irrigation development activities. This can be help to improve the watershed development to improve the springs discharge, rain water, sub and under surface water in the watershed for irrigation purpose. The plan and schedule consists how to improve efficiency of water supply, number of water users, irrigable land, crop etc based on participatory irrigation water development management motto. This can help to give equitable irrigation water distribution based on the need of farmers to farmers, village to village , block to block, and to eradicate improper resource utilization.

2. ***Principles of Cultural Difference:-*** The extension activities are based on the communities cultural and traditional norms. The irrigation users awareness start in on and improved step by step based on environmental situation. This means the IDA should know the communities traditional culture, norm , values, religion, skills, inputs, traditional tools for irrigation.

3. ***Principle of participation:-*** Participatory irrigation extension lead to farmers (households, youth, females) to contribute their knowledge ,skill and attitude in the

irrigation development extension starting from survey to construction of irrigation scheme and thus improve their potential to solve their problems by themselves.

Picture- 1:- The meetings shows that farmers tried to solve the problems observed in the irrigation water distribution

.

This may helps them the community by themselves tried to solve their challenges instead of external body giving solution to their problem, and make them strong.

4. ***Principle of Adaptability-*** Level of each IWU from other IWU differ in their awareness, knowledge, skill, attitude and application of irrigation development activities. The delivery of irrigation development extension service also differ from place to place. Therefore, the schedule of irrigation development extension should be adjusted by IDA's for the provision of extension, according to the situation of the place and their culture.

5. ***Principle of whole family-*** Implementation of irrigation development activities needs not only scientific knowledge and skill, but also capital and ample labour. Therefore, participation of the whole family in training and in contribution of their labour as well as their capital is essential to fulfil the gap. Thus, the IDA's should be used approach of participatory of the whole family in irrigation development. The extension service should be given to all family members**.**

Picture- 2:- Illustrates when farmers family discuss by themselves regarding their own field irrigation development

6. ***Principle of co-operation-*** The irrigation development extension needs improvement of cooperation, integration and linkage of stake holders to supply inputs and facilitate market with IWUA. These may help to introduce and distribute new irrigation technologies, organize information, strength value chain of market linkage, participate gender and youth along nutrition system, to make sustainable environmental

conservation, to establish strong monitoring and evaluation and identify and distribute best practice.

7. ***Principle of satisfaction-*** The final goal of irrigation development extension service is to increase the production and productivity of irrigation development products and solve the farmers social and economic problems and thus improve the national economic growth. Therefore, IDA's focus on the final destination of irrigation development extension to strength the farmers to be solve their challenges by themselves and make them satisfied on their work behavior and output.

8. ***The principle of the use of variety of teaching methods:-*** This one helps IDA's to make easily change the farmers attitude & improve their knowledge, skill and application then the farmer easily capture the new innovation to implement accordingly. Therefore, the IDA's should used variety of teaching aids and methods during farmers training based on the situation of the area.

Picture- 3:- The IDA's used vein-diagram and easily elaborate for farmers**.**

9. ***Principle of Monitoring and Evaluation-*** consistent result based monitoring and evaluation should be applied using scientific method and approach how attitude changes, skill & application improved due to the service of irrigation development extension delivered. This may help to take action immediately if the irrigation development extension may not give progress in irrigation development**.**

10. ***Principle of use irrigation Water Use Association/IWUA/:-*** most of irrigation development activities implemented using group method during construction as well as yearly maintenance. The guideline of irrigation development support the contribution of water utilization fee. Though, users should be organized in cluster approach and cooperate themselves to produce the same type of crop for market, management

of farm land, to maintain irrigation scheme, and to apply their challenges to concerned body that has beyond their capacity. Accordingly, those established IWUA before achieved better results and the IDA's should be establish new IWUA's in each scheme and should be use and based on the delivery service of irrigation development extension.

CHAPTER-2
SELECTION OF IRRIGATION TECHNOLOGY,
EXTENSION SERVICE AND ITS BASIC FEATURE

- The approach of execution irrigation development extension helps to support the farmers used SSI and large scale irrigation those who are embraced in IWUA's have to be used irrigation development information and adopt new irrigation development technologies and then improve production and productivities of irrigation products. This can be coordinated and lead by IDA's and irrigation development expertise. The communication approach of irrigation development extension should be based on technology, knowledge and skill of DA's and irrigation development expertise. The integration of other stakes that play key role on irrigation development are crucial in execution of irrigation development extension; such as:- irrigation development expertise and DA's, farmers used SSI & Large scale irrigation, different irrigation packages, irrigation development demonstrations, training and support, research, input supply and distribution, market, mechanized irrigation technologies and other support institutes are some of them.

2.1 Selection of Irrigation Technology

The selection of irrigation technology should be based on the practical situations and corresponds existed environoment of farmers. During selection of a certain type of irrigation technology, all handling and maintenance requirement needs consideration to ensure that the technology matches with the operational capacity and strength of farmers. This can best be done through close consultation with farmers to avoid decision-making based on pre-conceived and possibly mistaken ideas. Following are irrigation technology selection tools. The tools take into account the following criteria in order to be appropriate for farmers:

- Investment costs, in line with farmers' financial means, including availability and access to credit/saving plans for farmers,
- Investment costs that consider farmers' returns,
- Availablity of cultivable area for farmers,
- Types of crops to be grown had been identified by farmers,
- Amount of labour required and available for the technology ,
- Mmaintenance requirements, expenses and availability of spare parts,

- Durability and quality of the technology, and
- Physical strength needed for the operation of the technology for farmers.
- Features and Scalability/adoption rate of the technology
- Willingness and ability of farmers

2.1.1 Improved Micro-Irrigation Technologies

Several important new irrigation innovations have been developed and commercialized during the past few decades. These include automated sprinkle irrigation, micro-irrigation including surface and sub-surface drip systems, and sophisticated control systems for managing these technologies. On the other hand, MI technologies, commonly in use in water scarce areas of developed countries, constitute one such intervention with the ability to use water more efficiently in irrigated agriculture. The improved MI technologies that are suitable for small scale irrigation water user farmers in the country include:

- Drip system, piped distribution system for surface irrigation,
- Treadle/pedal, Rope & washer and motorized pumps for water lifting,
- Low-cost plastic water tanks to store water collected during the rainy season,
- Household water reservoirs for storage of rain water,
- Bucket and barrel ,
- Soil storage dum constructed on Gully
- Use of drought resistance and environmental tolerant improved varieties and hybrid seeds as well as blended fertilizers
- Tideridger
- On hill side and maountain irrigation system
- Tubwel
- Solar Pump
- Roof water harvesting, use pressurized and sprinkler hose.
- Hand dug wells,
- Use integrated pest management,
- Traditional & modern diversion weir

- ☞ Spring development & diversion
- ☞ Lined the existing main irrigation canal and use water effecintly, as well as expand the comand area.
- ☞ Construct family & community pond for water harvesting etc.

Some of the micro-irrigation technologies including its operation and maintenance are presented for our broader understanding and utilization.

2.1.2 Types of water storage structures

- ***Types of Rainwater water storage structures-*** Rainwater harvested from the rooftop (corrigated iron) is stored in either subsurface or surface tanks. These are constructed from a wide range of materials including: metal, wood, plastic, bricks, stone, Ferro cement, concrete, etc. Surface (Above ground tanks) are common in case of roof catchment systems, where the catchment surfaces are elevated. A key advantage of surface tanks over sub-surface tanks is that water can be piped by gravity to where it is required.

Figure. Underground water harvesting & above ground water harvesting

Photo- 1:- surface tanks water storage

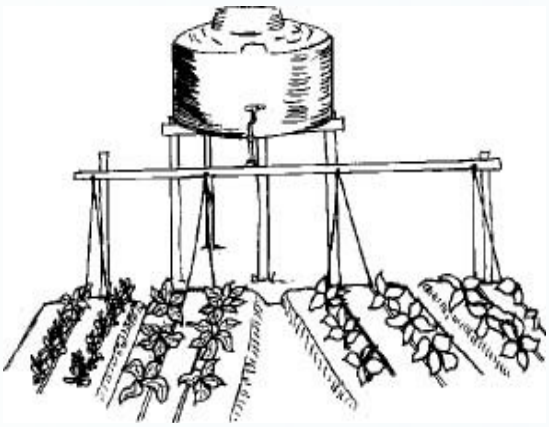
- ***Subsurface water storage:-*** This type of water storage is cheaper than surface water storage tanker and occupy small surface and the water used by pumps it up. Few materials used for construction and reinforced the wall of the tank. This type of construction helps to control the evaporation of water. Thus, to control the evaporation the reservoir should cover by any local materials found in the area. The tank should have inlet of water, reservoir, spill over, and cover

Photo- 3:- Thatch covered subsurface water storage

Photo- 2:- concreat covered subsurface water storage

2.1.3 Drip Irrigation

Drip irrigation is the most efficient method of irrigation with an efficiency of 90% (Jess striker's drip Irrigation Guidelines). It is easy to install, easy to design and reduces disease problems associated with high level of moisture. The family drip-irrigation system has been developed especially for family farming as a single production unit. It can be installed in open fields for growing vegetables, fruit trees and other crops. The system does not need any electrical power support because it works by gravity from a tank. Therefore, the cost of irrigation and expenses of maintenance are significantly low. This is especially important for mountainous regions and elsewhere there are water resources shortages



Picture- 4:-Easly constructed drip method irrigation

2.1.4. Roof water-harvesting technologies

- ***Roof water Harvesting:-*** This is the most common type of catchment used for harvesting rainfall. It consists of three major components: a roof that acts as a catchment surface, gutter and down pipe and a tank. Other possible components are filters or first- flush diverts to reduce the quantity of dust or debris entering the tank and access points for cleaning. Gutters and down pipes: is a major part of the system that transports rainwater from the roof to the storage tank. It is lightweight, water resistant and easy to join. To reduce the number of joints and thus the likelihood of leakage, a material that is available in long, straight sections is Preferred. Example of materials used for gutters includes bamboo, wood, PVC, iron sheet metal

Picture- 5:-Method of roof water harvesting

2.1.5 Water Lifting System

The most common type pumps used for extracting water from sub-surface storage is the hand pump or treadle pump. The use of wind and solar-powered pumps provides an environmentally friendly alternative. Extracting using a rope with bucket and beam with bucket are still common in many rural areas in developing countries. Extraction can be also possible using gravity systems and siphoning technique using plastic hose. The water collected is used much more efficiently for supplemental irrigation for larger areas

Photo- 4:- Pedal Treadle pump water lifter

Photo- 5:- Moter pump water lifter

Photo- 6:- Solar pump water lifter

Photo- 7:- Traditional way of hund lifting method

2.2 Irrigation Development Extension Service

Irrigation extension meant awareness and interest creation to build knowledge, skill and attitude of farmers, irrigation experts and input providers through advising irrigation water user,, individual housed farmers, and large-scale irrigation investors in all aspects of irrigation water development and management, including the formation of irrigation water users associations. It is an element of an agricultural extension system. Its function is to enhance adoption of improved irrigation technologies through training and advice to farmers, conducting demonstration to promote technologies, and promotes facilitation of linkages with other institutional support services (input supply, output marketing, credit etc.).

2.2.1 Essentials Features of Irrigation Development Extension

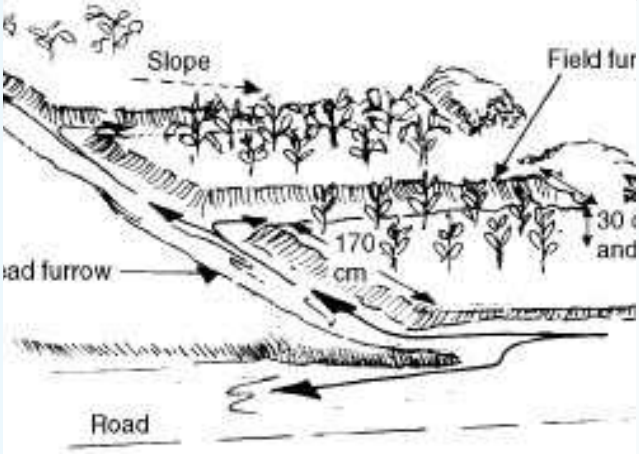
- ***Treating catchments for household water harvesting:*** Rainwater is the primary source for household water harvesting since the runoff water is collected from the catchment surface for storage in the reservoir or enhances the recharging capacity for ground water shallow wells that help irrigation to homestead farming. Here, the role of IDA& irrigation experts is to advice the individual households about soil conservation in the catchment surface to prevent silts and unnecessary flooding to the reservoirs and to increase the infiltration rate of catchments to enhance the recharging capacity of shallow wells.
- ***Mobilizing irrigation community for catchment protection:*** mobilization of community with kebele administration is very important for safe retention of catchment sites. Here the role of IDA and irrigation experts is to help mobilize the community, provide technical support on soil conservation techniques thus preventing silts and flooding to irrigation dams/ schemes. This could be training to the community on forestation practices using multipurposetree species of forest and grass plants and linking them with Woreda forest nurseries or private nurseries to obtain improved

Picture- 6 - Construct Soil & water conservation activities to keep irrigation scheame cachments

forest seedlings/saplings and farm implements that can help protect catchment sites.

- ***Ensuring equitable water distribution:*** IDAs with the assistance of Woreda experts and participates provide judicial advices to IWUAs and community pond users importantly to the irrigation team leaders those responsible for their irrigation blocks on provision of equal water distribution, water sharing and scheduling, and respecting water law.
- ***Ensuring maintenance services:*** IDA's role in this activity is very important to advice irrigation water users in respect of maintenance of their irrigation equipment's and SSI such as; SSI cannels, wears, treadle, motor pumps, drip system, conveyance pipeline (hosepipes), plastic water tanks and drums, sprinklers, community pond etc. Moreover, advice should be given on maintenance of ground water reservoir such as regular inspection, cleaning inside the reservoirs and minor repairs of any cracks or leakage. Besides the IDA and extension, experts should play a facilitation role between engineers and irrigation water users to advice the irrigation water and pond committees on maintenance, canal extension, critical operation and maintenance of schemes and ponds.
- ***Conduct irrigation water application techniques that decrease soil erosion***

A comand area may be affected and out of use by soil erosion due to situation of land and unproper utilization of water. Therefore, soil conservation techniques should be used on those slopy comand areas; as well as the IDA should give advise to farmers and the community should implemet accordingly.



Picture- 7- Broadbed-and-furrow system. Ensure that it is constructed so that excess water spills down the road.

- ***Don't over waited the command area:-*** over utilization of irrigation water as a form of flood in non sloppy area or in verity soil make the surface to be swampy and as a result a soil born disease appear. Therefore, the community should utilize the method of irrigation that IDA advice him/her and tried to drain the excess water with constructing drainage structures from command area.
- ***Limit use of irrigation water in saline areas-*** The national study shows that about more than 11 million hector land affected by salinity problem in the country. The salinity of land may be expanded due to using salty water for irrigation or improper utilization of irrigation water. This can be boost up because of mix-up the saline sediment under subsurface and pump to crop root zone or improper utilization of chemical fertilizer in command area. Therefore, the farmer should utilize irrigation water according to the IDA advice as crop water requirmnet.
- ***Use naturally existed pond and lake water for irrigation properly:-*** There are limited natural ponds and lakes existed in the country. These may keep the natural ecosystem in as well as social and economical situation condition of in the area located. Improper utilization of natural water body may affect all the life and environmental conditions. For instance, In East Harage zone Lake Lange existed near small town Lange and Lake Haromaya completely devastate by improper utilization of water from these lakes. Thus, during utilization such water bodies for irrigation water be carefully the inflow to the water body should be much greater than the out flow (irrigation water). Therefore, the community should utilize the advice of IDA and collaborate to develop water shed area
- ***Improve participatory & customer needs irrigation development extension:-*** The irrigation development need labor, resource & time expenditure. The IDA should work with collaboration of public institutions and on the interest of community along the advice of different irrigation development expertise to keep both the irrigation water utilization and command area in sustainable way. Therefore, keeping in mind that the irrigation development extension worker should partake the communities in command area keep their interest & needs in participation the extension system.
- ***Develope equetable irrigation water utilizatation both at bottom & upper stream users:-*** Naturaly existed river and springs serve to all living thins in and around the cathment area. However, due to the irrigation service,

the community may fully utilize the water with out considering the bottom stream users and lead to community disputes. Thus, the constructed weir and the spill over water should be left by the advice of the IDA.

- ***Ensuring canal cleaning and rehabilitation:*** The irrigation water users are encouraged to undertake cleaning of canals on a routine basis, especially the tertiary canals, and minor physical rehabilitation of the canals preferably within their irrigation blocks to enable smooth conveyance of water to other irrigation blocks without prejudice and anticipated conflicts with the adjoining blocks
- ***Assist in forming irrigation water users association:*** The major contributory factor for successful operation of irrigation schemes an institution that efficiently guides and effectively manages schemes with the participation of irrigation water users association (IWUA). IDAs and irrigation experts have an important role to facilitate the formation of IWUA among the irrigation water users through democratic processes
- ***Team-building for irrigation blocks irrigation water user team***: team building is an effort in which the team should study its own process of working together and acts to create a climate that encourages and values the contributions of team members. Here, the energy of irrigation water userare directed towards problem solving, task effectiveness, and maximizing the use of all members' resources to achieve the irrigation objectives. Besides clustering irrigation farmers (SSI) to work together in a similar crop or agro ecological situation is essential feature. IDA's and irrigation experts role is to work with the team on routine basis participate in the planning and facilitate the team on adoption of improved irrigation practices.
- ***Resolving water disputes:*** In case of water, dispute, community water pond and IWUAs committees are encouraged to come forward to provide solution to the problem. However, with the help of kebele administration, community water pond and with IWUA committees, IDA's and other irrigation expertsrole is to take initiative as a mediator to resolving water distribution conflicts among the irrigation water users.
- ***Facilitating irrigation water users in accessing irrigation inputs:*** The role of IDA and irrigation experts in this activity is creating inputs demand of irrigation water users, household farmers and large-scale irrigators for the planned irrigated farming in collaboration with the IWU committees. In addition, IDAs and irrigation expertfacilitatesirrigation water users and

IWUAs to accessinginputs that mean linking them with dealers/suppliers for improved seeds, fertilizers, pesticides, micro irrigation equipmentand linking to credit facilities and other technologies.

- ***Linking IWUto market opportunities:*** Irrigation extension is valuable when linked to specific market opportunities and traders. Irrigation water users are being equipped to respond to particular market demands. Here,IDA and irrigation extension expertis maintaining a constant link with market outlets, multipurpose cooperatives,Woreda trade&cooperatives. Facilitate and promote out grower and contract farming. Collecting market information, trading and conveying those to irrigation water users, household is farmers (in the case of MI or their groups) & large-scale irrigation producers. Facilitate linkage IWU to get good markets for sale of farm produces.
- ***Devoting time to irrigation extension and allied duties:*** IDAs and irrigation experts must be devoted and be in close liaison with irrigation water users, community pond committees, and household irrigation users. They can build mutual trust and confidence of irrigation water users by well-planned and gradual introduction of proven new irrigation technology and its rate of adoption.
- ***Encouraging IWU in ADP and Decision-making process:*** irrigation water users are encouraged to make active participation in planning and in decision-making for smooth operation and maintenance of irrigation schemes, community pond use as well as household MI schemes. Such participation will give irrigation water users a sense of ownership that help sustainability of the schemes.

- *Photo- 8- An Irrigation Development Extension should be implement in FTC (Jimma Zone, Mana Woreda, Ilasa Guda FTC)*

- ***Demonstrating new irrigation technologies:*** Irrigation extension is successful when suitable technologies are demonstrated for adoption based on farmer's participation, local conditions and availability of irrigation inputs. Here, the role of IDA and irrigation experts is to promote full package irrigation technologies by conducting methods demonstrations. Sequel irrigated crop or forage development stages there must be mini field days for IWU to show them essential steps of irrigated crop development. The mini farmers' field day help farmers to better understand issues through full package at each irrigated crop development stages. The mini field day can be organized based on the knowledge and skill difficulties identified during TNA. E.g. Seedbed preparation, land preparation/furrow lay out to demonstrate how to measure slope/gradient, transplanting, fertilizer application, compost preparation/ chemical application, harvesting and post-harvest handling, nutrition i.e. cocking, grading packing etc. The activity of pre scaling and comparison are activities related to the role of research institutions. IDAs and irrigation experts role is recording comparative advantage of technologies one over the other.
- ***Problem identification:*** One of the major roles of IDA and irrigation expert is to identify key problems associated with the operation of schemes, IWUA, community water pond, household irrigation(MI).IDA and irrigation expert shares the problems with IWUGs and suggest remedies or alternatively brings the attention of problems to relevant agencies for solution if it is beyond the capacity of farmers to fix their problems.
- ***Visiting irrigation schemes, community water pond & MI on a regular basis:*** This is an extension communication of "two-way traffic" in delivering technological information to the irrigation water users for adoption and at the same time taking farmers' problems and adoption experience to extension and research offices. Hence, the role of IDA and irrigation experts is to undertake visits to the schemes, community water pond & MI on a regular schedule/ program.
- ***Delivering extension messages (impact points):*** IDAs and irrigation experts should receive regular and suitable training on irrigation extension messages (impact points) relevant to the anticipated needs and activities of irrigation water users, household irrigation, community pond. The extension messages are important for technology adoption, technical guidance to irrigation water users' continuous follow-up and feedback collection of improvements or any change in irrigation practices. IDAs and irrigation expert should

delivermessages to and collect feedback from irrigation water users on a weekly basis.

- **Maintaining Research-Extension-Farmer linkage (REF):**The REF linkage is vital for successful technology development as research institutions undertake studieson irrigation issues and identifiesproblems of farmers in collaboration with farmers, IDAs, extension experts, extension agencies(input suppliers, seed multipliers etc).Besides, the institutions conduct joint on-farm demonstrationsand trials following a Participatory Technology Development approach in view to developing suitable improved irrigation practices for adoption. Therefore, one of the role of IDA and irrigation experts ismaintaining Research-Extension-Farmer linkage (REF).

The key point in irrigation extension is the regular fixed schedule of visits by IDAs and irrigation experts toirrigation water user so that the group knows when IDA and experts should be with them. In each visit, IDA and experts meet the contact farmer (irrigation user) of the irrigation block group. There are various approaches in establishing contact with as large a number of irrigation water users, household micro irrigation users and large-scale as possible. In the respect, the role of IDA and irrigation experts will be to use contact (model) farmer, individual communication method as the main channel of communication with other irrigation water users. The ultimate objective is to induce majority of irrigation water users to adopt improved irrigation practices.

The success of irrigation extension largely depends on the following factors:

- Proper selection of contact/model farmers,
- Timely and regular visits by IDA and irrigation extension experts to contact/model farmers and other irrigation water users,
- Identification of clear-cut irrigation extension messages (impact points) suited to farmers' needs and their diffusion through contact farmer/irrigation water user groups to others,
- Feedback of farmers' problems and their experienceon adopting extension messages,
- Well organized training program for IDAs and other irrigation technicians,
- Provision of Job-Embedded-Support (JES) to IDAs and contact

farmers,

- Close monitoring/supervision of irrigation extension activities by supervisory staff,
- A competent research staff and facilities to respond to technical issues and come out with location-specific recommendations on improved irrigation practices.

According to various experiences in irrigation extension, particularly in other countries where irrigation management is successful with tangible benefits to the farming communities, three special features, termed as PPP "Package", "Plan", and "Precision", has worked out successfully and could be potentially considered for promoting the use of improved irrigation technologies.

The "Package" refers to production inputs, which mean accessibility to inputs, timely available, equitable and efficient use of irrigation water, suitable, and improved technologies, balanced use of fertilizer and appropriate plant and livestock protection measures, need based training to both irrigation water user farmers, individual farmers, large scale irrigation investors and extension staff.

The "Plan" refers to listing of detailed irrigation activities, cropping calendar and pattern through active participation of irrigation water users, individual farmers (MI) in planning and in decision-making processes, and developing a monitoring system related to improvement and utilization of irrigation potential.

Finally, the "Precision" stipulates to adoption of improved irrigation technologies and extension approach (precise) for carrying out irrigation activities.

Gender Part-1

What are the issues of gender inequity?

Extension Service

- Women farmers have less contact with extension service than men do, especially where male-female contact is culturally restricted. Extension is often provided to men farmers in the assumption that the message will trickle down to women. In fact, agricultural knowledge is transferred inefficiently or not at all from husband to wife. In addition, the message tends to ignore the unique workload, responsibilities, and constraints facing women farmers. Technology
- Women generally use lower levels of technology because of the difficulties in access, cultural restrictions on use and the regard for women's crops as low research priorities.
- In adequate attention has been given by research to women farmers' need for appropriate technology to save them time and labor.

Photo- 9:-Women centered irrigation development users (by Dr.Akalu Teshome at Minjar shenkora woreda North Showa Zone)

- Most research ignores women's traditional knowledge on farming and crop husbandry.
- How can the gender issues be addressed?
- Ensure both FHH and Women in MHH targeted for extension service delivery.
- Encourage women farmer by arranging convenient time and venue, connecting women farmer with other women farmers to exchange experience, promoting couple based extension approach, Gender model family, organize separate training for women using women organization like (women association, women development group etc.)
- Promote gender responsive labor and time saving irrigation agriculture technologies
- Research needs to build on both men and women's indigenous knowledge and women farmers should be involved when priorities for agricultural research set and technology are identified
- What will be the benefits when gender issues are addressed?
- When women and men farmers equally have access to extension services, it enhance the adoption of irrigation technology. This Improve women farmer's productivity. According to FAO (2014), production will increase 23% when women farmers get appropriate extension services and this contributes a lot for nutrition and food security.

CHAPTER 3
METHODS & APPROACH OF PARTICIPATORY IRRIGATION DEVELOPMENT EXTENSION

The Participatory Irrigation Extension approach is an interactive and responsive to irrigation producer farmers' need by encouraging proactive involvement of irrigation water users in problem identification, prioritization, planning, implementation, monitoring and evaluation. It establishes mechanisms for irrigation water users to influence and share control over irrigation development initiatives and resource decisions that affect them. The approach boosts a learning tool for both irrigation water users and IDAs on how to develop operational procedures such as formation of IWUAs, and linkages with stakeholders that integrate rural and urban communities. The promise of participatory irrigation extension is that irrigation water users who have a sense of ownership in irrigation activities learn not to depend on the initiatives of others. This independence and self-reliance ultimately enhances capacity of the irrigation water users and communities to successfully managing their own schemes or water sources.

Furthermore, participatory approaches changes roles for extension experts, and IDAs from advisers to facilitators, and it affects change in organizational structures and moves toward cost sharing. The participatory approach constitutes a variety of key extension approaches for channeling irrigation extension messages and services for irrigation water management depending on the situation and need. Therefore, IDA sapply the following irrigation extension approaches according to the situation and need required for technology transfer with a particular reference to respective irrigation plans:

3.1. Essential preconditions to conduct Irrigation development extension

IDA should know the following few issues to before conducting irrigation development extension for all irrigation users (SSI, HHMI & Community water pond). Irrigation extension service is based on the following preconditions to provide advices to irrigation water users, individual famers (MI) large-scale

investors and professional consultations:

- ***Know the water supply -*** IDA and irrigation experts should understand the source of water as a key part of selecting irrigation extension approach, irrigation method or system that will deliver water efficiently. The availability, quantity and reliability of various sources of water are extremely important in planning an irrigation system e.g. to develop irrigation agricultural development plan. As important as a reliable source of water is, it is also important to understand the quality of the water so that IDA and irrigation extension experts will assist irrigation water users' crops selection and irrigation water users must understand and comply with local irrigation water laws and water right.

- ***Identify the soil type -*** A fundamental requirement for efficient irrigation is to know the type of soil or soils in the field. Irrigation extension experts and IDA can provide valuable information that impact irrigation efficiency, such as soil type and the water-holding capacity and infiltration rate of that soil. Having access to soils maps and/or surveying information is the role of IDAs and irrigation experts. Irrigation farmers should obtain some tips/guide about the nature of their farm soil to develop irrigation works. How their soil interact with the water source can influence the effectiveness of irrigation scheduling?

- ***Understand crop water needs -*** Irrigation agronomist through extension experts &IDA should provide advice irrigation farmers the stages of crop/forage development and response to changes in weather. IDA and irrigation extension expert should assist IWU farmers by accessing reference ET information from nearby researches or any other reliable source

- ***Select appropriate irrigation methods -*** Irrigation methods fall into two basic categories: pressurized irrigation and surface or gravity irrigation. Extension Experts and IDA will advise irrigation water users that irrigation water quantity, availability and reliability will influence the type of system that best meets the needs of the area to be

- ***Implement irrigation scheduling –*** apparently, IDA and irrigation extension experts are source of any agricultural related information for IWUA and irrigation water users. They assisted farmers in range of

issues that includes informed decision making, how farmers should use their resources and irrigation water scheduling. Irrigation scheduling is a planning and decision-making process used to determine the amount and timing of irrigation applications

- Proper selection of contact/model farmers,
- Timely and regular visits by IDA and irrigation extension experts to contact/model farmers and other irrigation water users,
- Identification of clear-cut irrigation extension messages (impact points) suited to farmers' needs and their diffusion through contact farmer/ irrigation water user groups to others,
- Feedback of farmers' problems and their experience on adopting extension messages,
- Well organized training program for IDAs and other irrigation technicians,
- Provision of Job-Embedded-Support (JES) to IDAs and contact farmers,
- Close monitoring/supervision of irrigation extension activities by supervisory staff,
- A competent research staff and facilities to respond to technical issues and come out with location-specific recommendations on improved irrigation practices

3.2. Identify irrigation development extension service users

3.2.1. Targeting

Farmers should get holistic irrigation agricultural extension services. Following groups and, associations listed below:

- IWUA
- Farmers pastoral & agro pastoralists,
- Women,

- ☞ Youths,
- ☞ Model Farmers
- ☞ Private investors engaged in agriculture,
- ☞ Riverside user associations,
- ☞ Will be organized into a grouping of spell-making activities.

3.3. Encourage farmers & privates to be participate on irrigation development

3.3.1. Encourage the private investor

Private sector actors are responsible to introduce improved irrigation practices and new technologies to enable them improve production and productivity. They should support the use of improved irrigation inputs, improved technologies to enhance postharvest management practices, transportation services, marketing reliable market etc. Irrigation water users will work closely with private sectors and improve technology transfer to improve their livelihoods.

3.4. Delivery of Market Oriented and Participatory irrigation extension service

This approach helps to increase irrigation producer farmers' income and improve their livelihoods through identification of farmer needs, provide market demanded technologies, market information, formulating effective irrigation extension program, link irrigation producers with large volume buyers ,input and credit suppliers, promote/ facilitate collective marketing by creating contract farming. Based on needs identified, irrigation extension messages are developed, and targeted to irrigation scheme, HHMI and community water pond. The needs can be broadly identified using techniques such as farmer information needs assessment (FINA), problem census, PRA and DA extension diaries.

3.5. Demand-Driven irrigation development Extension method

This type of extension method of execution helps the farmer to have sustainable livelihood because of improvement his income. Those techniques like Survey of identification farmers irrigation development needs, PRA, DA extension diaries

and etc used for execute irrigation development extension service

3.6. Multiple Extension Method

Based on planning, when necessary, a variety of multiple extension methods are used by IDAs, irrigation experts to reach irrigation water users with different types of technologies. Suitable methods in irrigation could be individual contact, some with groups, participatory technology development. In this case, a pluralistic irrigation extension can be applied to increase the reach of irrigation extension both for rural and urban producers. Collaboration and integration of public and private partners is vital in this case.

3.7. Coordinated and Integrated Extension

Introduction of coordination committees and partnerships among other institutional support service providers at various levels is a strong mechanism of coordination for integrated irrigation extension to meet diverse learning needs of irrigation water users. Through regional Irrigation Service Coordination Committee composed of relevant stakeholders is a centerpiece for efficiently coordinating the irrigation service in the region.

3.7.1. Agricultural research

Research will carry out problem solving demand driven irrigation technology development in consultation with irrigation water user. IWU farmers have long year's practical experience in irrigation and this can be a good base for researchers to develop or modify various irrigation technologies. The link between researcher Extension and farmers would gradually develop to ownership of the technology. In addition, agricultural research institution are expected to conduct capacity building of irrigation extension workers.

3.7.2. Input suppliers

Input suppliers play significant role in increasing irrigation agricultural production and productivity, postharvest management, processing, marketing etc., value chain of irrigated agriculture. As a result, IDAs and irrigation extension experts should timely identify IWU farmers input demand by type, quantity, provision time detailed to identify and reliable irrigation technology/input providers and

distributers. Accordingly,

- Identify IWU farmers' technology/input demand on timely manner (i.e. type, quantity, provision time etc.
- Compile and report the type of inputs/technology, its quantity and time availability to respective reliable input provider/ facilitator
- Requested input/technologies should be provided to IWU farmers via existing institutions

In case there exist leftover inputs/technologies, it must be reported by time and quantity to respective body

3.7.3. Credit institutions

Often credit facility is essential to provide inputs required to enhance irrigation agricultural production and productivity. However, credit service is crucial when it is less affordable to purchase required technologies. IDAs and extension experts should facilitate irrigation production loans by credit service providers at the point where a farmer / pastoralist cannot afford the technology required by the farming community. In this respect, credit institutions provide support to improve irrigation production, and reduce loss due to various reasons through enabling farmers getting of appropriate technologies.

3.7.4. Other private sectors and NGOs

There is considerable benefit in collaborating with non-governmental organization that directly or indirectly contributes to the growth or productivity of the irrigation agricultural sector at all levels. The capacity building includes; training, financial and material etc.

It is important to link coordination committees with different levels, with support, and service providers and partners in order to provide diverse learning needs for IWU and extension experts. To this end, the Irrigation Services Coordinating Committee, which will be established at federal, regional, zonal, woreda and kebele level. This will play an important role in coordinating irrigation service at all stages. The services includes coordination of water shade, input provision, irrigation land relocation, market, gender, research, assist functionality of IWU etc.

3.8. Scheme-centered Holistic Approach

An integrated, scheme-based, holistic approach is used to improve the efficiency of the whole scheme and enhance productivity and income of the irrigation water users. A scheme, HHMI and community water pond includes catchments area, headwork, the conveyance and distribution network, command area, and the irrigation water users. It has also impact on the irrigation water users and their use of water downstream. Participatory Irrigation Development and Management (PIDM) is a full-fledged irrigation approach in this case.

3.9. Gender-Responsiveness

Irrigation extension put emphasis on gender mainstreaming by involving women farmers and female in households in all aspects of irrigation activities, and ensuring that they benefit from irrigation water i.e. Scheme, household micro irrigation and community water pond. This is not only because of women farmers or because of female in household have less access to irrigation extension services or they are the list beneficiary from irrigation production to improve their livelihood. Women and female in household involvement irrigation is significant and their involvement increase production 30 to 35%. Their irrigation water management attested better than men did. Here the role of IDA is to motivate women from both female and male-headed households (single and married) actively engage in irrigated agriculture and in all aspects of irrigation production cycle. Create conducive environment for them to have access to and control over land, credit, inputs, technologies and marketing opportunities.

Picture- 8:- Participating womens in irrigation development activities may encourage other farmers

As members of irrigation-irrigation water user associations, women can participate in leadership, operation and maintainace, in addition to taking

advantage of employment opportunities. As farmers, engaged in both SSI and MI schemes, women can grow diverse and high-value crops for family food and nutrition, increased income, and enhanced livelihood opportunities. Women empowered, with men, in families and communities, can use irrigated agriculture as a path to their participation in larger development processes.

3.10. Participatory Technology Development (PTD) in Irrigation

PTD is an extension tool, which involves irrigation water users and other farmers in developing irrigation, and agricultural technologies that are suitable to their particular situation. Practically, farmers, as "insiders", bring their knowledge and practical abilities to test technologies, and interact with researchers and extension workersthe "outsiders".

Therefore, PTD is a process of developing technology, led by the farmers. Therefore, IDA in collaboration with research and Woreda irrigation experts and other key stakeholders will need to undertake PTD trials in the irrigation schemes. The purpose of PTD in irrigation extension is to:

- ✓ Testing irrigation water users' technology ideas;
- ✓ Testing a technology that has been successful under local conditions in regard to irrigation water management;
- ✓ Trying out a modification to an existing or recommended technology to see if it can be more successful under irrigated conditions;
- ✓ Developing irrigation water users' capacity to solve their own problems through experimenting with ideas in the schemes
- ✓

3.11. Organize farmers in IWUA and Community Water pond committees

The IWUA and pond committees are a key to the success of irrigated crop production since they are formal institutions established by the beneficiary IWU for their own interest in effective management of their schemes. IWUAs and pond committees play an integral role for overall management of irrigation system. Here, the participation of IWUAs and water pond committees in the irrigation efforts is important to provide service through which transfer of irrigation technology efforts occurs. If these channels are well established,

they are likely to survive even after the withdrawal of the support and provide sustainability to development process. The IDAs will need to develop a close link with the IWUAs and community water pond committee by facilitating them in all aspects of irrigation efforts such as participatory planning, training, monitoring, technical advice on improved irrigation practices, creating links with inputs and outputs markets, and importantly play a mediator role in resolving water conflicts. Through IWUAs and community water, pond committee the IDAs will be able to mobilize the irrigation water users in catchment treatment, maintenance of canals and equitable distribution of water.

3.11.1. Organize irrigation development team/irrigation block

Often irrigation extension service is provided to farmers and IWUs through organizing 1 to 5 development team. This is importantly effective in the case of household micro irrigation and community water ponds. For irrigation scheme in SSI, 20-30 IWU farmers are organized in one block. IWUA block structure is mostly based on irrigation land/farm proximity.

Model farmers head the development team and each development group has 5-7irrigation blocks. These Zoning Sub-groups will have 1 - 5 units / leaders.

A. Developmental leaders/irrigation block leader election

- Male or female farmer who can lead the group
- Should be model farmer and apply irrigation full package,
- Well known and anyone who wishes to communicate their knowledge and skills to other farmers
- Solve group IWU disputes and closely work with IDA
- Male and female IWU farmers who can express their opinion and ideas of others
- Those that have explore their idea and accept others idea;
- Those pro think the problems that will be occur on the scheme and solve the problem accordingly with cooperating the community.

Group/irrigation block leaders must carefully monitor active participation of women and Youths in any irrigation activities including extension advices and training. Where necessary, the development team members have the right to make the members alternate.

B. Duties and responsibilities of development team/irrigation block leaders

- Develop scheme based Agricultural Development Plan/ADP
- Coordinate group/block irrigation activities and facilitate Agricultural Development Plan/ADP
- In collaboration with IDA facilitate post-harvest management and use of post-harvest technology
- Collect and document basic information about members and their environment
- Reporting members' irrigation development reports
- Facilitate the implementation of ADP
- Encourage the irrigation block IWU farmers to implement full package
- Production of market oriented and high value crops
- Resolve water dispute that might create in development group/irrigation black.

3.11.2. Organize value-added development activities

Irrigation agriculture extension service is given based on local area potential and IWU farmers' interest in the production of irrigation specialty crops. Organizing IWU farmers in irrigation spatiality crop will help easily engage on value addition activities. Forming this group is then help to access various resource and technologies that may be difficult to one farmer. Following are activities that irrigation extension support with this regard;

- ☞ Support attention to farmers/ pastoralists, rural youth and women (e.g. pump maintenance, postharvest, transportation, agro-processing, etc.),
- ☞ Provide skill training in their irrigated specialty crop production,

- ☞ Strengthen supply chin, credit services and provide technical support

3.11.3. Organize women in groups

Although women have a significant impact on irrigated agriculture, they have not been able to access irrigation extension services as it supposed to be. This is mainly due to limited access to several extension services and information such as; limited access to inputs, credit, market access etc. Besides men and women, IWU may not have similar crop production preferences. Thus, in order to fill these gaps, women should be provided tailored irrigation extension services that can fit to their situation.

To enable women benefit from irrigation production income

- ☞ women centered extension training and advice
- ☞ Organize women with similar interest of irrigation production in a group
- ☞ Link women groups with credit services
- ☞ Provide women friendly irrigation technologies
- ☞ Strengthen women's labor and knowledge to help them solve their apparent problems
- ☞ Promote women's agricultural production and productivity, thereby contributing to the economic growth of the country

3.11.4. Organizing Youth Groups

Rural youths should be allowed to participate in various income-generating activities that benefit from the development of irrigation development services. The youth should benefit from improved irrigation technologies and benefit from the development of agricultural production and productivity using irrigation schemes. In this regard, it should be noted that activities need to be taken seriously.

- ■ Identify rural youths interest and organize them in a group,
- ■ Based on identified interest provide training and facilitate credit access

,

- Encourage youth participation in irrigation development and capacity development,
- Assist technology transfer through visit and experience sharing irrigation projects.

3. 12. IWUG in SSI Scheme

The IWUG of irrigation block plays an important role on technology transfer. One major benefit of the group is that irrigation water user supports each other to learn and adopt. Thus, user-to-user extension is amplified for technology adoption. The current context of institutional set-up of IWUA in SSI scheme consists of on an average 7 or 9 executive-committee members in the IWUA committee. The SSI schemes are divided into number of blocks based on the size of command area of each scheme. In the current context, the average size of SSI schemes has 5 to 7 sub-scheme blocks. The beneficiary-irrigation water users elect various types of committees of which conflict resolving, water distribution, Agricultural Development and soil and water conservation plan and the executive committee members are apparent. The IWUA executive committee assigns its members to perform as group leaders (contact for farmer) for irrigation water user group of each sub-scheme block

3.12.1. IWUA – sub group (Irrigation Block)

IWUG sub group is generally composed of 15 to 20 IWU, and is ideally manageable to provide a face-to-face interaction among the member users, better communication and free flow of information. Irrigation water users are encouraged to undertake maintenance and cleaning of the canals on a routine basis at primary, secondary and tertiary canal levels, and minor physical rehabilitation of the canals preferably within their irrigation blocks to enable smooth conveyance of water.

The benefits of IWUG include making irrigation extension services more demand-driven and efficient, strengthening irrigation water user' bargaining power with traders, reducing transaction costs for input supplies and output buyers, economies of scale (e.g. from bulking up in output marketing or storage),

facilitating savings and access to credit, and reducing public extension costs. In addition, the IWUG has other responsibilities to:

- ☞ Collaborate with IDA on irrigation water users needs assessment and monitoring,
- ☞ Develop a participatory irrigation plan with group leaders and IDAs,
- ☞ Forward the preliminary block scheme plan to IWUA for review,
- ☞ Create inputs demand, farm implements and other requirements,
- ☞ Select appropriate site to carry out irrigation trials or demonstrations,
- ☞ Conduct awareness campaign for beneficiary-irrigation water users in the block scheme for adoption of improved irrigation technologies as per advice of IDA,
- ☞ Assist the irrigation block group leader (contact farmer) in the procurement of inputs, team mobilization and problem-solving on water disputes,
- ☞ Participate in catchment development and protection, sharing of water resources, and participating in the training event.

In these case the IDA, irrigation experts can couch up IWUA members through individual contact, group or mass extension approach. Visiting blocks, individual farms are also important to make sure application/use of technologies and improve skill.

3.12.2 The role of sub-group (Block) Irrigation development team leader

The role of a sub-group (block group) in Irrigation development team leader (contact farmer) is to:

- ■ Contribute to creating a positive climate and fair distribution water within the block irrigation water users group,
- ■ Liaise between IDA, and keep informed about the progress of irrigation activities,
- ■ Provide leadership for helping the group develop to understand the role of each beneficiary-irrigation water users and their commitment toward successful irrigation water management for increased crop production of their sub-schemes,
- ■ Provide guidance and support for adopting improved cultivation

practices using hybrid cultivars, demonstrations as per the irrigation plan,

- Take lead roles in solving problems faced by the team, especially water disputes,
- Facilitate group members for access to inputs, technologies, credits and market outlets,
- Collaborate with IDA in extension campaigns, field days and discussions.

3.13. Develop an irrigation development Extension Group

Irrigation development authorities at all levels are required to bring about efficient irrigation extension service by motivating irrigation experts and IDAs. Awarding and recognizing better performing experts, IDA, public and private institutions. This can be done through establishing a system to provide, promotion, transfer, certificates, educational/training opportunities, working materials etc.

3.14. Create irrigation development incentives for those effective irrigation development users

Incentivizing irrigated agriculture includes; creating and promoting credit facility for farmers, giving farm insurance opportunity for minimizing risks and creating other many others opportunities that can promote irrigated agriculture

3.15 Documenting irrigation best practices and scaling up

The best practices /experience of irrigated agriculture is the technologies or practices that IWU have been leveraged over the traditional productivity. Farmers are encouraged to introduce and adapt improved irrigation practices and technologies and benefit from these technologies to improve their livelihoods. This is done through training, demonstrations, experience-sharing visits etc. Irrigation extension experts and IDAS, should collect, document/ consolidate good/best practices that can be scale out in similar agro ecology to other kebele, district, zone region etc.

A. Irrigation Technology selection

- Select a technology that best fit to IWU circumstances and can

improve their productivity,

- Accepted by local communities,
- Proven sustainability,
- Acceptable from environment point of view, etc.

B. Irrigated best practice selection and documentation

- Involve irrigation development partners in the process of irrigation best practices identification,
- Develop a checklist for irrigation best practice identification or apply the already prepared best practices identification guideline,
- Discuss on identified Irrigation best practices and build consensus
- Identify and document irrigation best practices
- Scale up the best practices i.e. share to relevant public and private institution

3.16. Establish irrigation development extension monitoring, evaluation and support system

One of the tools required to strengthen extension activities is to provide professional support to IWUs using participatory monitoring and evaluation system. The monitoring, evaluation and support is done in two ways. One is during implementation/execution of irrigation practices and the other is the whole system monitoring & evaluation. Monitoring and support is a series of information collection processes to identify the strengths and weaknesses of extension services. Selecting specific output indicators extension education and training courses, demonstrations, farmers field days, experience sharing visits, skills and attitudes. Both methods provide input for irrigation development extension plan, help to learn from best practices and bottlenecks, improve irrigation extension services, to keep track of ongoing missions by providing ongoing follow-up and professional support.

3.17. Establish Development Teams under Regional Extension System

Bureau of Agriculture is the major government institution responsible for planning and implementation of agricultural extension programs. According to regional extension strategies, the regular kebele DAs (other than IDAs) are responsible for two major extension events. These are provision of regular extension services to all farmers mostly in rainfed agriculture through formation of groups and training of selected farmers in the FTCs. Considering the group strategy, farmers in all rural kebeles of region are organized into teams called "Development Teams" consisting of 30-40 household heads in each team. Proximity of the residences of the farmers is taken as major criterion to form the development teams. As per guidelines of Bureau of Agriculture, the roles and responsibilities of the development team is:

- ✓ Implementation of approved agricultural/rural development plans of kebele,
- ✓ Exchange of information and experiences among the farmer group members,
- ✓ Mobilization of rural labors to carry out community level activities such as soil & water conservation, rural road construction, afforestation, etc,
- ✓ Identification and coordination of inputs and credit demand of the members,
- ✓ Solving administrative issues together with the kebele administration,

Since the development team has an important role in the food security development with participation of community farmers in the team as registered households, it is feasible for Woreda and IDAs to use these teams as a means for promoting improved irrigation technologies to farmers.

3.18. Operation and Maintenance

3.18.1 Operation and Maintenance of the Storage System

Inspection in and outside a tank should be made as a routine to see if any cracks occur on the wall or at the bottom. If the cracks are the minor ones, then they should be filled with water sealing material like cement mortar, asphalt mastic or plastic-tar mastic.

- A complete inspection should always be conducted before the season of storing water comes.
- During the operation, monitor water level and make recording.
- Take caution to check if there is any abnormal lowering of the water table. If noticed the water level dropping down very fast or even the tank is unable to store any water, it means there are serious problem happened.
- When water is flowing in but the water table can be raised only to certain depth then it indicates seepage happening in the wall near the water table.
- If water table is low and emptied, then the leakage must happen at the bottom. If large leakage occurs, it should be carefully inspected for any cavity behind the concrete or masonry.
- For the collection and conveyance ditch (channel), silts and weeds should be cleared regularly. Maintenance for the scoured portion of the ditch should be done on time. The sediment in the tank should be cleaned away at least once a year.
- The intake, drainage and flushing pipes should be properly maintained and cleaned regularly. Particularly, the entry gate and spillway of the water cellar should be carefully inspected.

3.18.2 Operation and Maintenance of the hand pump

Technical experts or trained farmers assist farmers on pump operation and maintenances. However, IDAs and irrigation experts can advise farmers on some routing but important aspect of operation and maintenance of pumps using their generic knowledge until the technical experts came and maintain the failed pump. Such issues may include;

Table- 1-Operation and Maintenance of storage and water lifting devices

Roof top	Pump	Pipeline (hoses)	Drip irrigation
During the rainy season first flush roof gutters, pipes, screens,	Checking pump pressure before operation	Inspect if there is any seepage point along the buried pipeline. When seepage is found, stop operation and repair immediately.	Prevent break of drip tube or drip tape caused by improper installation and moving, roll and unroll the drip line properly during installing or storing.
Check for leaks and cracks.	apply lubricating oil at the rotating part of pump	Do not bend or fold the pipeline when moving it in the field.	Gently switch on or off the drip line according to irrigation design when you start operation. Silts inside the tube should be timely flushed out to prevent from clogging
The tank must be serviced before the start of the rains.	Fill up clean water into the pump to expel out air.	Prevent aging of the pipes by sun radiation. .	When liquid fertilizer is applied together with water, flushing of the laterals should be taken within 10-20 minutes after irrigation is finished
Overflow should be visually checked before and after each rain.	Pump inspect frequently if all connecting bolts are properly fixed.	clean and store in a dry, cool and ventilated room	a frequent inspection and cleanout of the filter is required. It is strongly recommended to replace or repair damaged parts of the filter on time.
	Wash and clean up the pump, add on the lubricating oil at all running parts.	Before starting irrigation, open the end-cap of pipeline for flushing. Regular flushing is required after certain period of operation	
	Place it at a dry and ventilated room	Prevent creation of water hammer, open and shut off the valves of the pipeline in a slow manner.	

Gender Box 2. **Participatory Irrigation Extension Approach**

What are the issues of gender inequity?

Women are involved in all aspect of agricultural production however, their role are not yet sufficiently recognized and get proper attention. There are many evince that women involvement is very limited during the design of participatory irrigation extension.

Agricultural Development plan developed with limited participation of women farmers.

Limited involvement of female farmers in decision making related to technology selection, therefore, women's views may be by passed.

Low involvement of Women on O&M of SSI schemes and management of WUO.

How can the gender issues be addressed?

Women are the key actor of irrigation agriculture, by involving women in all aspects of irrigation activities and ensure to benefit from the scheme.

The Development agent at Kebelle level should ensure women (FHH and WIMHH) representation in the process of agricultural development plan preparation, technology selection and marketing.

Ensure that all male and female farmers are fully involved, informed and consulted during water distribution schedule. This is important to avoid night shift irrigation for female-headed households.

Ensure that male and female farmers are fully involved in decision-making during demonstration technology selection.

Ensure that male and female farmers through their WUO take over the full O&M responsibility for their SSI schemes.

What will be the benefits when gender issues are addressed?

Production is more effective and sustainable if women are involved in technology selection and preparation of agricultural development plan. When both women and men farmers are able to hear the same messages and voice their concerns, they are able to reach consensus together about mutual priorities and technologies will address the interests of both women and men farmers. In addition when the irrigation development plan addresses the needs of both men and women farmers, the SSI scheme will run more efficiently with greater production levels.

Picture- 9:- participating womens in irrigation development have both economic & social benfits

CHAPTER 4
METHODS OF IRRIGATION DEVELOPMENT EXTENSION COMMUNICATION

4.1. Selecting Extension Communication, Knowledge and Innovation

A critical component of irrigation-extension services are the way the process of information and technology transfer are set-up and the type of communication established. The process is determined based on irrigation water users' level of education, their knowledge and skills in irrigation and their access to communication means. Furthermore, the type and complexity of information that is conveyed is a factor in what format and pedagogic process the communication need to be established. They are the methods of extending new knowledge & skills to irrigation water users by drawing their attention towards them, arousing their interest and helping them to have a successful experience of the new practice. Based upon the nature of contact, the extension communication methods are divided into individual, group and mass-contact methods. In SSI, community water pond and MI schemes, three communication methods are predominately suitable for use in either the form of individual or a combination of all. IDAs and irrigation extension experts should consider applying of these methods as and when necessary depending on the situation and need.

4.1.1. Individual-Contact Method

Extension methods under this category provide opportunities for face-to-face or person-to-person contact between farmer and IDA. This method is very effective in teaching new skills and creating goodwill between farmers and IDAs. The region emphasizes working with groups as part of national agricultural extension strategy. However, there are some occasions when individual-contact becomes necessary to visit an individual farmer or a household or in the irrigation scheme.

Advice on individual basis: The principles of advice involve:

- Only the one concerned irrigation water user can really know his/her problem,w
- Ensure confidentiality (e.g. no notes to be taken during the discussion),

- Keep your promises,
- Ask rather than tell.

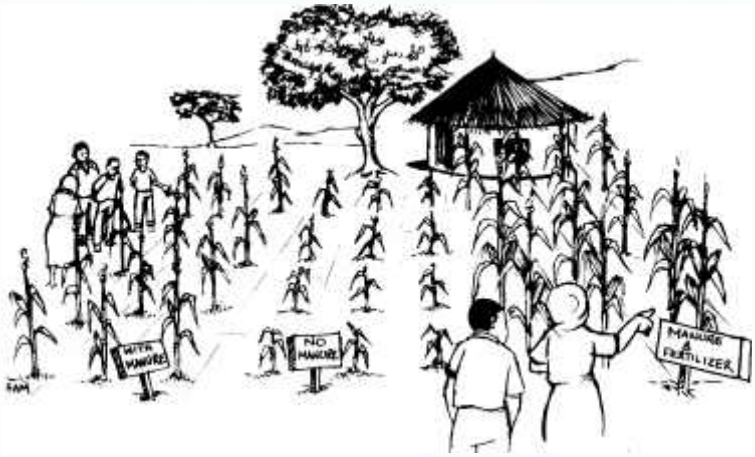
The main purpose to visit an individual farm in the scheme, community water pond or household is to identify and analyze the main problems and to provide advice on the best actions to take for overcoming them. In many other situations, the purpose of individual-contact methods includes:

- Specific advice has been requested by a irrigation water user of the scheme or household,
- IDA and irrigation extension experts may develop their knowledge of a particular area or the irrigation scheme and identify some of the common problems of irrigation water users face,
- IDA and irrigation extension experts may create awareness amongst irrigation water users they have visited and stimulate their involvement in irrigation extension activities,
- IDA and irrigation extension experts may familiarize with a particular farm and farm family, including non-agricultural activities which contribute to the family's livelihood,
- IDA and irrigation extension experts may learn about innovative irrigation practices or MI scheme management conducted by a particular irrigation water user,
- IDA, irrigation extension experts andirrigation water user may discuss overall irrigation planning and management.

Although individual farm/scheme visits are important way of establishing rapport with irrigation water usersand building trustor confidence in the extension service, they take time to plan and implement making them an ineffective method for reaching larger number of irrigation water users, and they are costly extension methods and should be carefully thought out and planned.

During field visit, IDA and irrigation extension expert should always use words and language that farmer understand and is accustomed to. In this respect, they need to be good listeners as well as good talkers. Farmers should be encouraged

to explain and discuss issues at their own pace and in their own words. IDA and irrigation extension experts should ask appropriate questions so that she or he understands the nature of a farmer's concern.



Picture- 10:- Farmers that have been participated on irrigation development activities can be encoraged thrugh using house to house visting

In sum, such extension communication approach is applicable persuade irrigation farmers to assist adoption of new irrigation technologies, solve individual farmer challenges, assist women farmers, solve critical conflicts, assist skill improvement etc. The tools are farm visits, house-to-house visit, personal calls, personal experience sharing, interview etc.

4.1.2. Group-Contact Method

Under this category, irrigation water user forms in a group; this usually consists of 15 to 20 farmers. These groups usually form around a common interest in irrigation water management and within the proximity of their irrigation blocks. These methods also involve a face-to-face contact with the irrigation water users and provide an opportunity for the exchange of ideas, for discussions on problems and technical recommendations, and finally for deciding the future course of action. Groups are main means of contact between IDAs, irrigation extension experts and irrigation water users sharing information and technology transfer. They play a critical role in problem identification and innovations. It is a key part of irrigation extension processes.

It is more difficult to provide extension advice to every single farmer with limited extension staff and resources. Traditional extension approaches are often top-down and ineffective. Working with groups of irrigation water users allows IDAs

and irrigation extension experts to interact with larger numbers of irrigation water users at the same time, using scarce resources efficiently. In addition, groups communication method than individuals communication method best perform in many activities. Group members can pool their labor and other resources, divide tasks into manageable units, learn from one another, and make decisions jointly. The benefits of group method are:

- By uniting and contributing to a common pool, the group members are able to achieve things they would not be able to do as individuals. Many sustainable irrigation techniques are labour-intensive; the groups allow farmers to share labour to make improvements in their irrigation schemes. They reduce the burden of work for individual farmers by sharing it among many,

- Farmers can share irrigation implements, machinery, planting materials and other resources,

- Every group member receives a tangible benefit (such as a water tank, knapsack sprayer, storage etc.)

- Groups provide an opportunity for strengthening friendship and teamwork, allowing members to share ideas, insights, experiences and problems,

- Groups provide a forum for experts and IDAs to introduce ideas and skills that may be relevant to the irrigation water users' problems and needs;

- Groups can seek funding and advice from private sector and NGOs or donor organizations to support their irrigation development work. This type of support is not usually available for individuals.

- **Guiding the group:**Many of the activities in the list below are continuous and happen at the same time. The IDA and irrigation extension experts should help and guide the group members through a participatory process, rather than forcing them or making decisions for them. Therefore, the IDA/ irrigation extension experts should:

- Conduct an initial survey to find the farmers' attitudes and priorities, and to gain an understanding of the irrigation water management and

its environment.

- Collect information on the local land, soil and climate types, vegetation and crops, social and economic characteristics. This survey can be collected through a combination of PRA techniques, questionnaires, and a review of existing information collected by Kebele administration and key informants. The survey can be conducted by IDAs with the help of Woreda irrigation experts,

- Help the farmers prioritize their problems and identify possible solutions and opportunities,

- Discuss the group approach with farmers. Tell them the importance of group approach,

- Help the farmers in the formation of groups as IWUT for irrigation schemes,

- Identify potential farmers willing to join in the group. Group members should have common features: they may farm the same type of land, grow the same crop within the SSI, community water pond or MI schemes or have similar irrigation equipment. They should attend group meetings, be interested in the topic, and willing to learn and share their knowledge with others. The ideal size of a group depends on its aims and focus. However, groups of about 15-20 farmers seem to work well. Participation of women in the groups provide an opportunity for women to learn, generate income, and take on responsibilities and leadership within the community;

- Help the group to determine what it wants to do, its aims and activities, plans and responsibilities. This should be a continuous process: the group should review its plans on a regular basis as conditions change,

- Help the group work out its dynamics and working procedures: how are meetings conducted, how is work organized, how activities are evaluated? Provide training on subjects such as facilitation, leadership, management, group dynamics and record-keeping, if required,

- Help the group decide how to run the group. It should develop a set of

rules and byelaws with the help of IDAs. Determining these rules and procedures is a continuous process. The group should not try to fix them all at once, and should be willing to review its decisions as conditions change,

- Help the group to select its Group/Team leader through a democratic process. The Team leader will perform as a Contact farmer. The main role of the team/group leader is facilitation, problem-solving, mobilization, leadership, guidance and initiative, and develop linkages with potential stakeholders;

- Help the group decide how to handle money and maintain accounts;

- Help the irrigation water users identify promising irrigation technologies that they wish to test and adapt. Help them design and implement field tests of these technologies (see the section Participatory technology development approach);

- Arrange training and field visits to introduce the new irrigation technologies to the group members. Experience sharing visits to research sites or other SSI or MI schemes are particularly useful to demonstrate new technologies and how problems can be solved,

- Assist the group to refine and implement its plans,

- Create linkages with woreda offices, research, cooperatives, inputs dealers, credit agencies, market and NGOs so the group can access services and resources such as seed, fertilizer, credit, irrigation equipment and marketing facilities,

- Evaluate the results with the group members. Arrange evaluation sessions with all members, and invite members from other groups to help disseminate information more widely. Such sessions are a good opportunity to learn the feelings, needs and priorities of irrigation water users.

The following are the group extension methods:

- ✓ Method and Result Demonstrations,
- ✓ Field days,
- ✓ Farm walks,
- ✓ Group meetings,
- ✓ Folk media
- ✓ Motivational tours,
- ✓ Participatory technology development,
- ✓ Formal training preferably in FTCs,
- ✓ Farmer field schools

Method Demonstration is undertaken to show how something can be done systematically for teaching new skills and practices. While planning method demonstration:

- ✓ Decide the purpose of demonstration
- ✓ Prepare the operational schedule, step by step
- ✓ Identify key points
- ✓ Select and procure material and equipment needed
- ✓ Prepare supporting visual aids
- ✓ Prepare kits for trial by the learners
- ✓ Rehearse the demonstration, and
- ✓ Publicize to collect the audience

While conducting the method demonstration:

- ✓ Check that work place is convenient or not
- ✓ Make sure that audience can see and hear
- ✓ Find out what they know already about the practice
- ✓ Get them interested in learning the practice
- ✓ Explain the purpose of demonstration

- ✓ Show each operation step by step, while narrating it
- ✓ Repeat steps whenever needed
- ✓ Stress key points and tell the audience that they are important
- ✓ Present carefully, slowly and patiently
- ✓ Seek questions for each step before going to next step
- ✓ Present other visual aids in time appropriately
- ✓ Summarize all steps covered at the end
- ✓ Give chance to the audience to try by themselves, and
- ✓ Distribute supplementary materials

During follow-up,

- Have a list of participants
- Help the participants who seek additional information, and
- Make a sample check of their skills and satisfaction

Result demonstration: It is to demonstrate or show what has happened or gained as result of using a given technology or practices. In other words, it shows why a practice should be adopted by physically showing how a new or different practice compares with a commonly used local practice, for example, to demonstrate application of fertilizer and its impact on yield and quality. It is a demonstration conducted by the farmer under the close supervision of the extension staff. While planning result demonstration in schemes:

Photo- 10:- Partial view of irrigation development activities implemented in Geremba FTC demonstration area at Kenbata Tembaro Zone in SNNP.

- Identify the problem to be solved
- Decide the objectives
- Gather complete information
- Seek the assistance of the clientele in planning and carrying out the demonstration
- Develop a complete plan of work
- Select accessible demonstration plots, and
- Visit the host farmer and work with him
- During the demonstration request the area leaders to co-operate
- Visit the demonstration site often and ensure success of irrigation scheme
- Use the demonstration site for meetings and tours
- Keep the results of both sites (the traditional and the new), and
- Publicize the demonstration

Lecture: Lecture is one of the most common forms of presenting information to an audience, particularly of a large size. During lecture, communication is mostly one-way: while the lecture goes on the audience listen and (normally) take notes. The effectiveness of lecture boosts and increases the morale of extension experts or IDAs while disseminating irrigation technologies to farmers.

Advantages of lecture

- ✓ Useable with large groups of audience
- ✓ Easy to organize as compared to other teaching methods
- ✓ Within a short time, many subjects can be taught, and
- ✓ Can be used just almost everywhere

Disadvantages

- ✓ Minimal contact between the teacher and participants, no participation, on feedback;
- ✓ Not effective to reach higher level objectives, for example, synthesis, valuing, analysis; and
- ✓ Not that much effective for illiterate people

4.1.3. Conduct Field day on irrigation development

Field Days: It is a day or days in which an area containing successful farming or non-successful farming is open for people to visit.

Planning field day

- ✓ Identify the objectives to be achieved
- ✓ Select a demonstration site in the scheme
- ✓ Work with area leaders and the farmers
- ✓ Publicize the field day
- ✓ Display signboards at the field day site
- ✓ Arrange for an exhibition of related materials, and
- ✓ Arrange for transportation, if possible

Holding the field day

- ✓ Distribute literature about the practices being demonstrated
- ✓ Take visiting farmers around the plot
- ✓ Let the host farmers explain the practices being demonstrated and new things he/she has learned, and
- ✓ Hold group discussion with the participants

Follow-up

- ✓ Evaluate the field day, and
- ✓ Contact the farmers, who indicated interest

4.1.4. Conduct experience sharing on Irrigation development

Study Tours/Field Trips; Farmers are shown farms and experimental fields outside their own areas. Its function is to make participants aware of innovations away from their home or gain an experience of other farmers. Planning field trip refers,

- ✓ Identify the objective of the trip
- ✓ Set aside adequate time to plan the trip
- ✓ Contact site operators to obtain permission to visit
- ✓ Secure transportation

- ✓ Draw a tentative schedule
- ✓ Finalize detailed schedule
- ✓ Co-ordinate with site hosts

4.1.5. Mass-Contact Irrigation extension Communication Method

Region has to approach a large number of irrigation water users in the schemes for disseminating new information and helping them to use it. This can be done through mass-contact methods conveniently. These methods are more useful for making irrigation water users aware of the new irrigation technology quickly and availability of inputs and relevant services. Individual and group contact methods cannot reach every single irrigation water user who might need and use the information. The extension methods covered in mass contact are:

- ✓ Radio,
- ✓ Television with satellite antenna,
- ✓ Internet facility,
- ✓ Newspaper,
- ✓ Print media and audio visual aids,
- ✓ ICT in extension

In this case, mass media, including Radio, rank at the top in the awareness and interest stages of learning. Radio communication is one of the fastest, most powerful and in many countries including Ethiopia, the only way on communicating with rural people and irrigation water users. Radio has been playing a significant role in bringing awareness and technological change among rural masses through Farm Broadcast Programs.

The other relevant print media materials are posters, leaflets or folders are meant to provide sufficient information to irrigation water users. These materials create awareness among the community for technology adoption and dissemination.

Posters are usually large pieces of paper that displays a simple message for potentially large number of irrigation water users and other farmers. They can be used to advertise or publicize a forthcoming extension event or communicate simple technologies or information. They are able to generate interest without

requiring additional information. Ideally, the posters are colorful and attractive, and are displayed in an accessible place, e.g. market area, or community meeting point, FTC or Woreda offices.

Leaflets/folders are printed pages that provide notes on the subject matter of a lecture or demonstration, or a topic of special or urgent interest. They are useful reference materials for people including irrigation water users to keep it. By using them during extension events participants do not need to make notes. Leaflets/ folders can be particularly useful in providing details of extension messages or impact points, by helping participants to remember specific information about names of improved crop varieties, source of agricultural inputs, irrigation equipment, agro-chemicals, markets, etc. Regions recognizes one of the key extension strategies for technology dissemination is through mass media for quick and timely transfer of technological information through Farm-Radio Broadcast for effective extension services to farmers.

ICT in Irrigation Extension

The government of Ethiopia through its recently introduced National Agricultural Extension Strategy (clause 3.2.1) emphasizes on promoting digitalized and ICT-based extension communication system in the country. In Ethiopia information reaches farmers mainly through indirect (radio & TV) and direct verbal communication channels which include training, meetings, conferences and social gatherings, followed by learning through direct observation. The effectiveness of these channels can be enhanced by enabling farmers to have access to new information and communication technologies (ICTs). ICTs are an efficient and scalable way of getting information to farmers in an engaging form for example, “Digital Green video based approach” is a technology platform where farmers themselves demonstrate best agricultural practices to their fellow farmers through videos and respond to each other’s questions.

The irrigation extension experts will exert their concerted efforts to help diversify the extension communication channels to effectively reaching farmers in diverse social classes (gender, wealth, age, etc.) and agro-ecologies, with consideration of sustainable development of SSI and MI schemes. The following ICT activities are proposed:

- Promote ICT-based technology by using mobile phones, IVR-8028, video-based approach, farm radio, TVs etc.
- Knowledge resource centres
- Use of social media

4.2. Important Considerations in Selecting Suitable Methods

The extension-communication methods are the tools and techniques used to create situations in which communication can take place between farmers IDA and irrigation extension experts. A proper understanding of these methods and their selection for a particular type of irrigation intervention are necessary. IDA and irrigation extension experts will make an assessment on how to reach farmers and which extension communication method will be appropriate based on the given situation in irrigation schemes. How should IDA decide which method is most appropriate? One key factor is the stage and an understanding of adoption process.

The adoption process is consisted of five distinct stages: awareness, interest, evaluation, trial, and adoption. It provides a useful guideline for selecting appropriate methods applicable in irrigation extension.

4.2.1. Awareness stage

In this stage, knowledge of the innovation is critical to the individual irrigation water user. Mass media and popular theatre are the preferred methods because they can reach many irrigation water users at the same time. In using the mass media, IDA must pay attention to the characteristics of the audience targeted in terms of using their local language, culture and social norms in presenting content to its audiences.

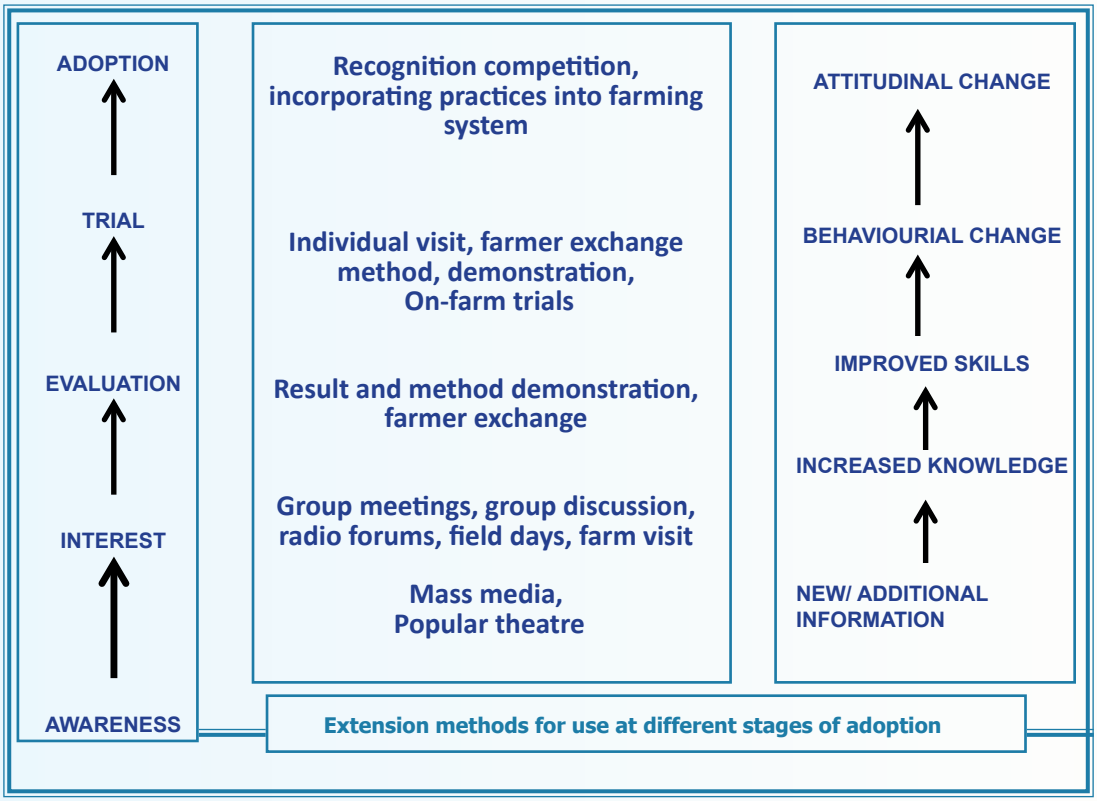


Figure- 1-Adoption Stages

4.2.2. Interest stage

This stage emphasizes on the adoption process, knowledge continues to be important, but building a positive attitude towards the innovation becomes the critical issue. For this reason, the desired methods should include information strengthening and attitude building as their goal. These methods should use the senses of hearing and sight, either individually or collectively. Group meetings, group discussions, radio forums are suggested for strengthening knowledge, while field days and farm visits will allow individuals to see what they have been hearing, thus providing the opportunity for building the desired attitude towards the innovation

4.2.3. Evaluation stage

This is the most critical stage in the adoption process, because the outcome usually determines whether individual irrigation water users proceed to the trial and adoption stages. At this stage, people need to match knowledge against

facts. Irrigation water users need to be assured that what they heard and saw are indeed workable. Result demonstration, farmer exchange, and field days are recommended because they allow individuals to reinforce their interest by viewing tangible evidence. Within this group of methods, farmer exchange is an important method.

4.2.4. Trial stage

The irrigation water user's technical and management skill should be the main area of target. The individual visit becomes the most preferred method at this stage, and the needs of individual irrigation water users must be taken into consideration. This means that IDA will have to develop a plan for each individual irrigation water user or group of irrigation water users in similar situations. The IDA/irrigation extension expert has to remember that, although similar irrigation water users are adopting similar techniques, the problems experienced are not always the same. At this stage, methods for reinforcing the irrigation water users' interest by the use of farmer-irrigation water user exchange and skill training can be useful in helping individuals to continue adopting.

4.2.5. Adoption stage

In this stage once, the farmers start adopting; extension should continue to support their efforts. Recognition programs encourage irrigation water users to continue adopting. The goals and criteria for these methods is to carefully develop so as not to bring out any negative effects because of poor planning and implementation. To achieve the maximum results from the methods selected at different stages, IDAs and irrigation extension experts must bear their understanding of the learning process. For instance, in-group meetings IDA/irrigation extension experts can use a lecture format, supported with a video, and followed with group discussions. While in selecting the above suitable methods in irrigation extension, IDA/irrigation extension experts should take into consideration of the following criteria:

Cost: selecting methods, which can be implemented within a budget, and are cost effective;

Coverage: choosing group extension methods that will reach more irrigation water user farmers;

Complexity: selecting simple methods that do not need many materials, or a lot

of time to plan and implement;

Skill: choosing methods that IDA/irrigation extension experts has capacity to implement, if not training may be required

Targeting: selecting methods that are especially appropriate to irrigation water users etc.

4.3. Irrigation Extension Outputs

Awareness creation - people need to get timely, relevant and adequate information before their behavioral change is acquired to reach at the level of changing themselves. Awareness creation should be arranged to deliver necessary information to beneficiaries so that they will bring behavioral and attitudinal changes among themselves.

Improving knowledge - When extension message is complex, getting understanding about it may not be easy. Under such conditions, it needs the beneficiaries to learn some basic principles about the specific practices incorporated in the message.

Improving skill - When the beneficiary is being aware of something, but unable to perform the required tasks as the results of lack of adequate skills, it needs to equip them with necessary skills through demonstration, farm-to-farm visits or training course.

Behavioral change - When the issue under consideration is needed to be understood and agreed up on, the beneficiaries have to be convinced. The alternative extension method is related with group methods and demonstration, allowing a strong information exchange between people. Experiences show that by elaborating and demonstrating the economic advantages of the new ideas/ techniques to the beneficiaries will convince them very easily.

To increase irrigation production and productivity, first awareness on the appropriateness of current production system has to be raised through community information meetings. This is even necessary when the problem is not understood by the community, but identified by DAs. After beneficiaries got necessary awareness and developed interest, training may be delivered training and workshop. The next step will be inviting the clients to be involved in demonstration, followed by a discussion. During the discussion, a study group could be initiated to encourage the participation of the beneficiaries in a demonstration or visit a place where improved technologies and best practices

are already practiced. Members of the group initiated to adopt the new practices/innovations, could then participate in demonstrating the new idea in their group. Thus, the following steps can be used:

- Create awareness on their existing situation
- Invite them to participate in training and demonstration
- Identify whether if the beneficiaries de-linked themselves from their current practices and bring behavioural change to accept the new practices
- Identify specific skill required to achieve the intended development goal by the beneficiaries

4.4. Innovation Management System

An innovation is a broad terminology that can refer to a completely different way of doing something or to modification of an existing technology. Farmer innovation starts within the lifetime of farmer and not something inherited. Farmer innovation may arise from indigenous knowledge or modern scientific knowledge. The unique characteristic of farmer innovation is that the innovator is adding value to the body of knowledge, which its origin might be modern scientific knowledge or local wisdom of farmers. In this connection the innovation, process is the effort made by farmers to make the technology fit to own reality or improve effectiveness, efficiency, productivity, profitability, durability, marketability, palatability, adoptability, sustainability etc.

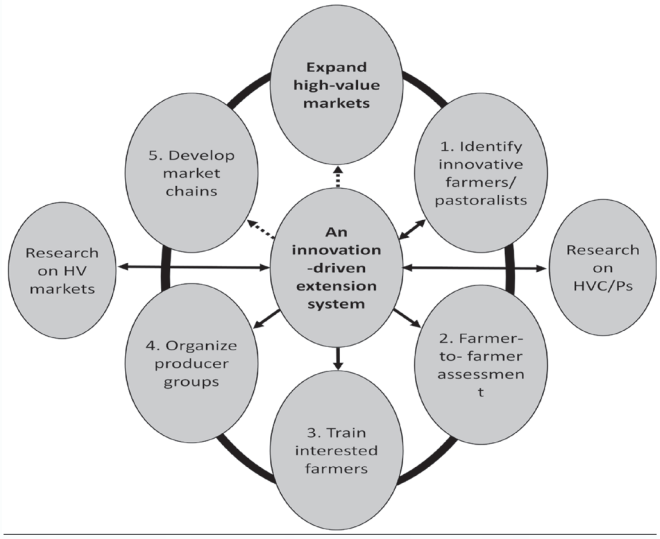


Figure- 2- Innovation Extension System

Source: Swanson (2009); Note: HV = high-value; HVC/Ps = high-value crops/ products

In brief, farmer innovation as a process is all about conducting informal experimentation by farmers and the innovation, as a product is the value change that may take place in the middle or at the end of the process. Innovative irrigation practices can enhance water efficiency, gaining an economic advantage for farmers while also reducing environmental burdens. Water-efficient methods and better irrigation scheduling could also integrate water and nutrient management, thus minimizing agrochemical runoff and leaching problems. According to a study of most farmers' irrigation practices, there were often mismatches between crops' water demand and irrigation applications on several occasions during the season. Although the overall seasonal applied irrigation depths may match a crop's water demand, farmers often under-irrigate during the early crop stages and over-irrigate during later stages; many choose inadequate timings and application depths

4.4.1. Role of Innovation in Extension

Innovative farmers play a key role in innovating by demonstrating how to intensify and/or diversify current irrigation farming systems. These farmers are often successful; in Ethiopia, some have become "farmer millionaires." These innovative farmers play a strategic role grounded in their interest in pursuing new high-value crops, livestock, or other enterprises to increase their farm income. They do this first by assessing emerging markets for these new crops or products vis-à-vis their specific agro-ecological conditions, land, and labor resources, as well as their access to these markets. Second, on a small-scale trial basis, they attempt to successfully produce and market these crops or products. Once successful, they begin to scale up their own production. In extension system, these innovative farmers are considered as "farmer professor" roles—where they share and disseminate their learnings and promote the scale-up of successful innovations across farming communities.

Many small-scale farmers within these communities are aware that innovative farmers are trying something new, but few are willing to learn more about these new enterprises or are able to handle the potential risk unless markets exist to absorb the different crops and products. As markets expand for these crops and products, many of these enterprises become scalable. Here, as shown in Figure-2 below, is where an innovative extension system can first identify these innovative farmers and their respective enterprises, and then begin the process of engaging other farmers in scaling up the enterprises among different groups of farmers,

given land and labor availability, gender of the farmer, and farmer interest. In most rural communities, small-scale and women farmers are generally unaware of these emerging markets, but once they learn more, especially through farmer-to-farmer assessment, they are soon ready to learn how to produce and market these products on a small-scale basis to minimize household risk.

Figure- 3- Knowledge Management

Again, innovative farmers and "farmer professors" can play a strategic role in this process by helping extension organize these interested farmers into producer groups so they can begin working together to produce and market these crops and products. These start-up producer groups usually begin by supplying local markets, but as they gain experience and expand their production, they begin serving larger urban markets (meaning developing value chains) and, in some cases, global markets.

While the field-level extension staff can facilitate this process, they need strong back-up support from research and the private sector because in most cases even innovative farmers do not have the most up-to-date information and technology relating to these crops or products. The key linkage mechanism in helping DAs gain access to this information and technology is the SMSs at the woreda level.

First, however, they need to become aware of these emerging markets and then to learn more about how to produce and market these crops and products. In addition, as they become aware of these emerging enterprises, the SMSs can facilitate the training of DA (by research staff and/or the private sector) and then help the local producer groups link together into woreda-level producer associations that can eventually supply larger urban markets. Finance also plays a critical role at this stage of development. As more farmers become interested in the new opportunities, finance can act as a catalyst to growth by providing new farmers with the capital required to participate in new market opportunities

4.5. Strengthen Agricultural Knowledge Management within Irrigation Extension System at Various Levels

Knowledge management is a process that includes knowledge creation, identification, and utilization, storage, sharing and learning. Knowledge is developed through experimentation, adaptation, confrontation and other learning settings that result in knowledge products. In knowledge management, farmers, researchers, extension agents, policy makers, and others are considered key actors in influencing the knowledge process and its ultimate utilization. For the circular flow of knowledge management to happen, both knowledge that is sufficiently better than the existing knowledge and means for transmitting it must be available. In knowledge management, the synchronization of scientific knowledge with indigenous knowledge is critical for reinforcing and developing applicable and re-refined knowledge. To improve the effectiveness of agricultural knowledge, it is essential to develop a mechanism that generates captures and disseminates knowledge and information with effective processes and institutional arrangements as well as effective utilization of information and communication technology (ICT).

Hence, following key interventions are proposed. This strategy intends to enable the integration of traditional knowledge of farmers with modern knowledge (generated from research, universities and extension), and to further enhance the utilization of knowledge disseminated to small farmers.

- Strengthen/establish vibrant synergies for knowledge management and networking among key development actors.
- Use information and communication technology (ICT) to facilitate rapid, efficient and cost effective knowledge management
- Strengthen and better network FTCs to be used as a source of irrigation agriculture knowledge and information exchange among researchers, extension workers, and farmers and as an input for policy.
- Establish working online and offline platforms using the ICT tools to easily connect and facilitate collaboration among the various agricultural development actors (including extension workers, researchers, etc.).

- Involve male and female farmers in the knowledge management process and generate knowledge in a participatory process to increase the chances of its adoption. This also enables the integration of indigenous knowledge of farmers with recent research findings and further enhances the utilization of knowledge disseminated to smallholder farmers.

4.5.1. Local/ Farmer Innovation

Local innovation refers to the dynamics of indigenous knowledge, which is the knowledge that grows within a social group, incorporating learning from own experience over generations but also knowledge that was gained at some time from other sources but has been completely internalized within the local ways of thinking and doing. Local innovation is the process through which individuals or groups discover or develop new and better ways of managing resources, building on and expanding the boundaries of their indigenous knowledge. The innovations may be not only in the technical but also in the socio-institutional sphere. Especially in drier areas where livelihood systems are highly vulnerable to climatic risks, successful local innovations often involve new ways of gaining access to or regulating use of the natural resources, new ways of community organization, or new ways of stakeholder interaction. Local innovation through informal experimentation has always been taking place in all parts of the world, but it is only recently that increased attention has been given to identifying and documenting the innovation process and the innovations.

4.5.2. Promoting Local Innovation

In the past, mainstream rural development efforts were focused on technical interventions aimed mainly at controlling or manipulating nature using external inputs. In the South, these efforts generally failed to give poor families more secure access to food and to improve their livelihoods. While there were some successes, these were limited to specific agricultural enterprises such as coffee, tea and dairy farming in more humid areas. The dominant approach to research, extension, and education for rural development still follows the pattern of “transfer-of-technology”. This is based on the assumption that scientists create knowledge that would be packaged and spread by extension services to farmers. This approach effectively squelches local creativity and innovation. They promote participatory action learning by resource users and supporting agencies in order to develop the local innovations and complementary techniques further.

A positive approach that starts from local ideas that focuses on local people's strengths and explore the particular opportunities open to them – rather than dwelling on their weaknesses and problems – is a key to stimulating innovation.

4.5.3. EIrrigation Development Extension innovators

Those farmers who are in the front line to take up new technologies introduced by extension workers are regarded as innovators. Nevertheless, in reality are these same people; the farmer innovation approach is concerned about? No, they are not. Farmer innovators are not the classical adopters of technologies, which are brought in to the system by extension workers. They in fact sometimes adopt but they always try to adopt the technology to their own reality, through making essential changes that deem necessary. They have the courage and commitment to make changes on what so ever they learn from others and make it more realistic to fit in to own situations. This is indeed only one manifestation of who innovators are but the other and most important characteristics of innovators is, that they do work on Indigenous knowledge (IK) and make it more responsive to their problem situations. In short, they are not relying only on scientific knowledge as a point of departure and inspiration but also on Indigenous knowledge, which they have adopted from their ancestors.

Farmer innovation as an approach is not referring at all to new 'practices' of farmers that may come into picture as a result of application of "transfer of technology approach", which involves number of training activities and extension services. However, the approach duly recognizes the wisdom of farmers to adopt technologies through putting it in to a series of transformational processes so that to make it fit to own realities. From the perspective of technology adoption, this approach is therefore an alternative to help extension workers and researchers overcome the limitation of technology transfer model, which is most often blamed for being not responsive to the reality of farmers living in diverse and complex environment. Therefore, though it recognizes farmers who are keen to learn from extension workers and adopt technologies as it is, the main trust of the approach is to focus on farmers who are consciously practicing agriculture to come up with something new or testing the incoming technologies using their own wisdom and experiences to make it fit to own realities.

The following equation may help to explain farmer innovation in a very comprehensive way. It should however not be considered as a model that

exclusively explains what farmer innovation is Farmer Innovation

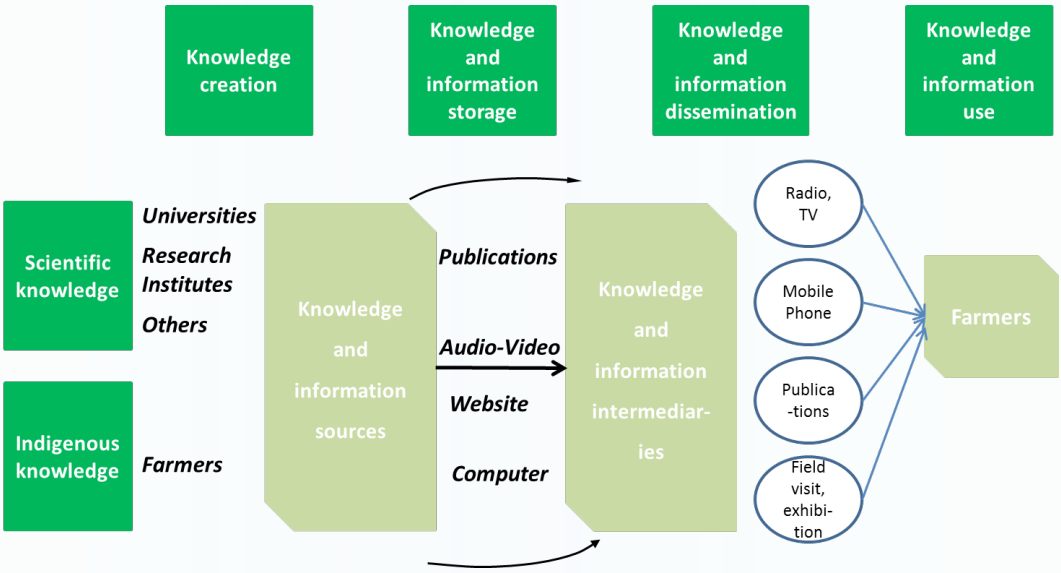
(FI) = Farmers Wisdom (FW) + [-] Indigenous knowledge (IK) + [-] Scientific knowledge (SK) + Value Addition (VA)

FI= FW+ [-] IK+ [-] SK+VA

The mathematical singe + [-] indicates that farmers are making changes on the IK or SK and this changes could be explained in terms of eliminating some ideas/ practices or putting new elements to the body of knowledge under consideration. Value addition is indeed the emergent property of the innovation process. In this process, completely new values could be 'made' or added to the pre-existing ones. This may depend on the type and complexity of the innovation.

4.6. Participatory Innovation Development (PID)

PID is based on the notion that for rural development the local informal knowledge of villagers is equally important as any scientifically generated, formal knowledge. However, the two types of knowledge are different. In PID the systemic – often reflects knowledge of villagers about their own complex situation is combined with external knowledge, which includes scientific knowledge, as well as the knowledge of farmers from other areas, extension experts, etc.



(Adopted from UNDP, 2012)

Figure- 4- Creation, Accumulation and Dissemination of Agricultural Knowledge using different Methods

The challenge in PID is to arrange creative interaction between the knowledge, experiences, and skills of villagers with those of

scientifically trained researchers and of extension experts. The emphasis then is on conducting practical experiments together in villages.

The objective is to find new things and ways that work. Of course, in most cases these are just the clever recombination of elements of familiar technologies, or the combination of known elements with new elements, which are brought into an area. New things and ways should be compatible with and embedded in the local knowledge systems. New things and ways work when they are practical and applicable for the concerned farmers without major outside support. Means of production must be available and affordable, and markets accessible. Processes and organization must be manageable with the locally available capacity. Although PID often deals with experimentation on agricultural practices, "new things and ways that work" are by far not limited to what is usually called "technology." Many problems of, and opportunities for, farming families are not technological ones.

4.6.1. Local innovation

Is the process by which a given locality discovers or develops new and better ways of doing things – using the locally available resources and on their own initiative, without the pressure or direct support from formal research or development agents?

4.6.2. Local innovations

The outcomes of this process, for example, farming techniques or organizing work that is new for that particular locality. It refers to outcomes of the process.

4.6.3. Farmer Innovators

The innovators are those who are doing something outstanding to improve their lives, their communities and/or their environment. They are local people who develop new ways of farming or managing natural resources, building on local knowledge but using new ideas from various sources, including their own creativity.

4.6.4. Documenting Farmers' Innovation

Documentation refers to the process of providing evidence ("to document something"). Documentation in the case of local innovations or PID refers to capturing evidences about local innovations, experiments, and PID process. Gathering evidences of local innovations in documented form is a good starting point for promotion of PID. By documenting innovations one gets closer to farmers, understand their ideas. Innovations can be documented by making photographs, in video, and audio like radio recording. Information about a certain innovation can be collected using various methodologies such as observation, questionnaire, case or research studies. In the documentation process, one has to answer the following:

- for whom – seeking identity of the user;
- why – the internal and external needs;
- where – the location, the innovation is going to be operated/placed; and
- what – the product that is visualized and eventually promoted

4.6.5. Formats to document Innovations

- Type of innovation
- Reasons for the innovation
- When was the innovations started?
- Where did the idea come from? New External (Modified Traditional (IK)
- How much time have you spent so far in developing your innovation?
- Labour used for innovation
- What is required for use in the innovation?
- Problem experienced with the innovation
- Any ideas on potential solution?
- How many other farmers have copied the innovation?
- How did they find out about the innovations and when?
- Does anything make adoption more difficult (experience?)
- What are the innovations costing the rest of the community?
- Any other innovations?

Gender Box 3. Selecting Extension Communication, Knowledge and Innovation

What are the issues of gender inequity?

During selection of extension methods, the approach being selected might be adopted for all types of beneficiaries irrespective of gender, education and age.

In most cases, household or head of the household is targeted with a perception that husbands share the lesson to their families.

During group contacts, women farmers might not attend the programs due to their triple roles and busy schedule at home. In a mixed group meetings, women remain passive recipients. They might think that men are more knowledgeable and even male farmers and extension workers/IDA might perceive women do not know about agriculture. Perhaps nobody might encourage them to participate actively in meetings.

To mainstream gender and facilitate women participation in extension services, extension workers and IDAs may not have the necessary knowledge and skill. Perhaps difficult for them to identify women's real needs and preferences. They might also have limited skill on how to involve them in extension services through workable and practical way.

There is limited participation of women in male-headed household in extension services due to their less decision making power at household level.

IDAs prefer to work with household decision makers, in most cases men; on technology adoption, in this case importance of women's participation is not taken into account.

There might be cultural barriers for IDAs reaching women farmers alone. In addition, time and place for the services might not be convenient for female farmers.

How can the gender issues be addressed?

Not all extension approaches are equally important for both men and women. What works best for men may not work equally for women. Women in general and WiMHH in particular prefer approaches designed to meet their specific developmental need, easily understandable and applicable. In most cases, they preferred a house-to-house/individual contact method followed by practical demonstration. They build trust on the technologies demonstrated practically. An individual contact method is highly preferred by WiMHH because it can be arranged at a convenient time for them, it can be a kind of informal communication, and women can express their interests freely.

Since both men and women participate in an irrigated agriculture, it will be good to target the household as a unit including men and women together for trainings and demonstrations to let them have the same understanding of technical issues. During the training, it is good to have 'men only' and 'women only' groups to avoid male dominancy and create conducive environment for women to participate freely and confidently. Extension workers and IDAs should encourage women farmers to participate and target youths who take responsibility of farming in FHHs.

The extension workers/IDAs who are working with the grass root communities have to be trained on how to train, how to design a women friendly training and how to choose the most appropriate and suitable approach for women participation in extension service provisions.

IDAs have to look for approaches which encourages sharing household responsibilities and decision making which reduces women workload and increase their decision making power at household level. This will have a direct impact on their participation on irrigated agriculture and extension services.

During provision of the extension services, it is important to consider who delivers& who receives the services and information and how the services are delivered. If there is cultural barrier for IDAs to reach women farmers or if women farmers are not comfortable dealing with male IDAs, the extension agents have to employ different approaches. Some of the approaches can be; contacting their husbands first and explain the purpose to visit them, visit the family/with their husbands, meet women in group, seeking support from GOs or CBOs working on women. It will be also good to communicate IWUA women sub committees, if any in the area.

What will be the benefits when gender issues are addressed?

Women and men farmers equally have access to extension services and sustainable livelihood changes can be achieved. Technologies will be easily disseminate and adopted by farmers. Women will be empowered and household food and nutrition security will be ensured.

CHAPTER-5

IRRIGATED CROPS VALUE-CHAIN THROUGH AGRICULTURAL COMMODITY APPROACH

The current National Agricultural Extension Strategy of Government of Ethiopia pillar four stated that transforming subsistence farming to commercialized farming through the implementation of value chain that emphasizes on market-oriented extension approach services in various agro ecologies. Irrigation agricultural production and improve the livelihoods of smallholders. However, to-date, the irrigation extension service is typically focused on promotion of improved irrigation technologies and good practices to increase production and productivity of irrigation farmers without giving due consideration to value addition and marketing. Experiences showed that increasing production alone does not necessarily reward farmers with better income unless it is liked to a holistic market.

On the other hand, farmers run subsistent irrigation agriculture by largely producing their household consumption in which the scenario shows emphasis on volume of the product. This is because the farmers want to secure annual household feed and settle financial obligation like tax and household clothing, rather than doing value added in each step of production, particularly on irrigated crops commodities that could have fetch high income for farmers.

Demand for irrigated agriculture has been increasing due to government and farmer's due attention to make agricultural economy resilience's to natural hazards and increasing nature of global climatic unusual. Being recent increasing nature of irrigated products, their value chain is not well defined and most farmers and irrigation agricultural extension experts have limited capacity. Accordingly, a well-defined and applicable irrigation commodities value chain and marketing extension approach should be prepared.

- Capacity development on Value chine and market oriented irrigated agriculture production to irrigation extension and other technical staffs at different level (kebel, woreda, zone, region and federal)

- Continues promotion and strengthening of irrigation commodity that focus market collaboration and linkage with irrigation development actors

- Strengthen ICT based market information access to irrigation farmers, IDAs, irrigation extension and other technical staffs

- Inclusion of irrigation commodity production, value addition, marketing curriculum in IDAs and extension experts trained in a ATVETs

Promote irrigated crop contract farming Scaling up of irrigation commodities values chain and market oriented good practices

5.1. Meaning of Value Chains

The value chain is a concept, which can be simply described as the entire range of activities required to bring a product from the initial input-supply stage, through various phases of production, to its final market destination. The production stages entail a combination of physical transformation and the participation of various producers and services, and the chain includes the product's disposal after use. As opposed to the traditional exclusive focus on production, the concept stresses the importance of value addition at each stage, thereby treating production as just one of several value-adding components of the chain

5.2. Irrigation product Value Chains Concept and Issues

The macroeconomic landscape, policies, laws, regulations, standards and institutional components such as research and innovation, human resource development and other support services form the environment in which all activities take place.

Value chains tend to be more complex, to involve numerous interlinked activities and industries with multiple types of firms operating in different regions of one country or in different countries around the globe. For instance, agro-food value chains encompass activities that take place at the farm as well as in rural settlements and urban areas. They require input supplies (seeds, fertilizers, pesticides, etc.), agricultural machinery, irrigation equipment and manufacturing facilities, and continue with handling, storage, processing, and packaging and

distribution activities. Other components such aselectric power, logistics, etc., which form the chain environment, are also important factors affecting the performance of irrigation product value chains

5.3. Irrigation commodities value chain and marketing extension approach

To transform subsistence farming to commercialized farming system effective market oriented irrigation extension system is important. This can be attained through capacity development of irrigation extension technical staffs at different level on principles of vale chain, marketing, agro business etc. Implementation of value chain extension that emphasizes market-oriented and high value crops following ACC approach is imperative. The irrigation extension experts that are found at different level should follow underneath extension approaches according to their context.

1. Capacity development on Value chine and market oriented irrigated agriculture production to irrigation extension and other technical staffs at different level (kebele, woreda, zone, region and federal)

Among other activities of capacity development, conducting trainings for IDAs, irrigation extension experts on the base of training need assessment on selected irrigation commodity value chain, accessing market information to IWUA.HHMI and community water pond users, and creating operational linkage with relevant market actors includes irrigation input suppliers is essential.

2. Continues promotion and strengthening of irrigation commodity focused market collaboration and linkage with irrigation development actors

Creating linkage platforms with business enterprises, who can take ownership of a product during the transaction of process of a product on particular value chain commodity. E.g. Tomato, avocado etc. Capacitating IWUA, HHMI and commodity water pond users to undertake meetings and discussions to solve Irrigation agriculture commodity cluster (IACC) issues.

3. Strengthen ICT based market information access to irrigation farmers, IDAs, irrigation extension and other technical staffs

IDAs and irrigation extension experts should advice IWUA, HHMI and community water pond users to implement collective marketing to improve their bargaining power by supplying irrigated commodities at required scales, establish market infrastructures e.g. Temporary warehouses. Accessing reliable market information on irrigation commodity production quality, amount, price, input and their prices, quality and quantity of agro processers and consumers demand.

Picture- 11:-irrigation products should link to market to be build sustainable development

4. Inclusion of irrigation commodity production, value addition, marketing curriculum in IDAs and extension experts trained in a ATVETs

5. Promote irrigated crop contract farming through strengthening IWUA, community water pond and HHMI users

6. Irrigated commodity diversification and specialization

7. Scaling up of irrigation commodities values chain and market oriented good practices

5.4. Irrigation commodities value chain and marketing extension activities

5.4.1. Value Chain Analysis of Irrigation Developmenet product

Irrigation Value chain analysis is the process of breaking a chain into its constituent parts in view to better understand its structure and functioning. The analysis consists of identifying chain actors at each stage and discerning their functions and relationships; determining the chain governance, or leadership, to facilitate chain formation and strengthening; and identifying value adding activities in the chain and assigning costs and added value to each of those activities.

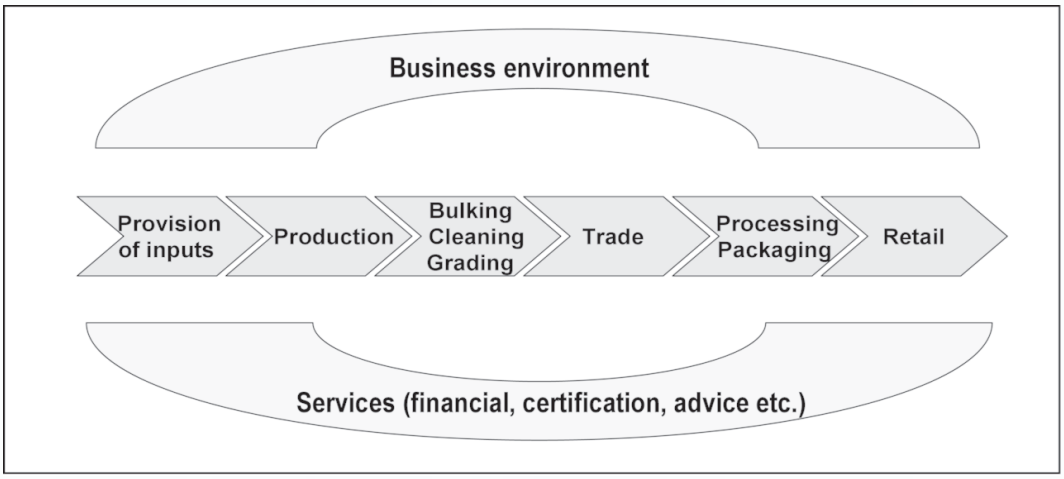


Figure- 5 Synergies among different actors

The flows of goods, information and finance through various stages of the chain are evaluated in order to detect problems or identify opportunities to improve the contribution of specific actors and the overall performance of the chain. Value chain analysis scrutinizes interactions and synergies among actors and between themselves, the business and policy environment. Thus, it overcomes several important limitations of traditional sector assessments that tend to ignore the dynamic linkages with and among productive activities, occur outside the particular sector or involve informal operations.

Value chain analysis also reveals the dynamic flow of economic, organizational and tough activities involving actors within different sectors. It shows that power relations are crucial to understanding how entry barriers are created, and how gain and risks are distributed.

It analyses competitiveness in a glob a perspective. Thus, value chain analysis helps to reveal strengths and weaknesses, of participating actors to develop a shared vision on how the chain should perform and to identify collaborative relationships that will allow them to keep improving chain performance.

5.4.2. Purpose of irrigation development Value Chain Analysis

Irrigation value chain analysis is a useful analytical tool that helps to understand overall trends of irrigated crop production, storage, processing, handling, and packaging marketing and distribution, industrial reorganization, identify change agents, and leverage points for policy and technical interventions. Development assistance agencies to better target their support and investments in various areas are increasingly using irrigation value-chain analysis such as trade capacity, enterprise competitiveness, income distribution and equity among value-chain participants' especially male and female household farmers, youths etc.

5.4.3. Value Chain Analysis of Irrigated Crop Commodities

- Enabling Environment for irrigated crop value chain

Ethiopia has been formulated rural centered economic development policy and strategy that favor and enhance agricultural economic development through intensive land and labor utilization and capital saving mode of production. Economic Policy and strategy has been aimed to realize free economic system in which irrigated crop value chain actors in the production system have the right to produce, allocate resources in the system of irrigation production function, selling irrigated product at any price and anywhere the producers or actors of the chain can realize maximum benefits. Government intervention level in the economic development has created favorable conditions to facilitate and amend probable market failure in input and output market of irrigated agricultural economy. Moreover, the government has carried out irrigation-infrastructure development investment where private partnership is not willing to intervene.

Government has supported strategic inputs supply such as fertilizers and research services. Generally, fiscal policy that favors exporters of irrigated agricultural products and monitory policy, which prioritize agricultural investments of the nation, is favoring well-functioning of value chain of irrigated crop commodities, in particular horticultural products.

Concerning regulation, ministry of agriculture and standard authority and conformity is institutional set up favors irrigated crop commodities investment inputs regulation to make irrigated products fit with the compliance. Quarantine services and plant health clinics, are those institutional setups to provide phyto-sanitary services, which enables efficient and effective function of value chains.

- Facilitating institutions

The regional government in Ethiopia has established irrigation process unit to provide irrigation extension services, irrigation infrastructure development and scheme administration. In the process of irrigated crop production, the regions are facilitating irrigation development through planning, input demand collection, supply and distribution facilitation. The regional cooperative agencies, unions and cooperative federation institutional setup that stretch from region to district is responsible in coordinating, managing and controlling input demand and supply through unions and distributive service cooperatives.

The regional Bureau of Agriculture is an institution, which create enabling environment for smooth delivery of extension services at grass root level and input supply and distribution coordination. Plant health clinics and different agricultural laboratory centers are institutional setup, which have a greater role in efficient and effective functioning of irrigation production.

Trade and market development is an institution working on provision of commercial service that enables free entry and withdrawals of actors in trading of irrigation commodities or produces. Such system motivates innovation for value chain actors to maximize the values of irrigation commodities through promotion and efficient production system that leads to maximum earning. Irrigation resource property right like land right, and other irrigation investment right is encouraging in irrigation development to make the chain more efficient.

Farmer's organizational setup such as development team and one to five arrangements are important institutions, which enhance demand for irrigation development, capacitate farmers in operation, and make value chain more

efficient as experience of model farmers easily transferred to non-model farmers through production function.

- Development of irrigation value-chain

Production and mobilization, the first touch point on irrigation value chain starts with mobilizing the farmers for development of irrigated agriculture. At this stage, farmers become aware about how to utilize their resources for irrigation development. After they have motivated to produce irrigated agriculture product they made to plan to produce crops that enables them to earn high revenue. Moreover, input required to produce the irrigated crop product at each stage needs prior planning of which included:

☞ **Input supply and distribution**

Demand for input which is based on the request of farmer's willingness and ability to pay is collected and compiled to be supplied and delivered for farmers in preparation phase of irrigation developments.

☞ **Training of farmers**

Based on the training need assessment of farmers during pre-production or preparation phase, training events are conducted both on-farm and FTCs. At this stage, farmers are trained on how to solve development constraints based on the following procedure;

- Farmers identify systematic problems and their cause that understate irrigation development
- farmers identify systematic bottleneck that hinder effective and efficient operation of irrigation value chains,
- Impact of the systematic bottleneck in the value chain of that revealed itself in the form of economic, social and governance is supposed to be explored by farmers at the time of training

Lastly,farmers should suggest applicable solutions in their context to make efficient and effectiveirrigation value chain.

5.4.4. Irrigation development plan follows valuchain

Irrigation development planning is undertaken after farmers are trained and demand for irrigation has been created. Farmers demand each individual farmer prepares demand driven and market oriented irrigation planning and it is presented to one to five and development team forum to make the plan participatory and easemonitoring and evaluation of the performance through the course of implementation.

- **The weak link of irrigation value chain that require intervention**

This chain is base for effective and efficient operation of other part of irrigation value chain products. As it has been known irrigation product quality and volume that determine the value created at each step is a function of labor and other resources mobilizations, level of farmers training to make them capable of solving production constraints, level of efficient system of input supply and distribution and the way irrigation development planned and owned by implementers. The weak link of this chain that has negative impact on the other irrigation product value adding has been identified to be intervening as follows.

- ☞ inadequate resource mobilization
- ☞ Irrigation input demand request collection is insufficient and not on time
- ☞ Input supply system is not responsive to farmer`s effective demand in time, place and price. This makes farmers to look for black market as an alternative that leads to undesired procurement and use of poor quality inputs that result poor function of irrigation value chain production.
- ☞ Fragmented irrigation land and absence of clustered based irrigation production. It also leads a difficulty for input provision and marketing.
- ☞ Farmers, IDA and extension experts' have inadequate knowledge, attitude and skillon irrigation values chain. Hence, farmers training is not effective.

Therefore, this show individual farmers planning of irrigation development

cannot emanate from individual irrigation development demand. Such circumstances make implementation part much weaker and understate the value created through the production chain.

- **Post- harvest handling chains**

Collection of harvested product is the initial stage at which chain of post-harvest begins. Method and time of collection of harvested product has significant effect on the value and volume of the product. Collection method significantly determines post-harvest loss of irrigated products. Post-harvest operations in the chain are as follows:

- ☞ Determine time of collection of harvested products
- ☞ Determine method of appropriate collection methods and instrument for collection
- ☞ Sorting of the product based on desired criteria
- ☞ Transporting to the site of sorting and grading
- ☞ Grading of the product
- ☞ Scaling the product
- ☞ Storing in appropriate place
- ☞ Packing and distribution in desired size for trading

- **Weak link of post-harvest handling value chain**

This chain is an area where excess post-harvestloss occur. The reason why a lion share of lose has been occurred is that producers and professional advisers have not been give due attention to the operations done in this part of value chain. Most researchers, policy makers, producers and development supporting institutions have been giving much more due attention on pre-production and production chains while a huge lose has been occurring at this post-harvest stage. Therefore, areas at which attention be given to enhance value gained in the entire value chain of horticultural product.Weak links that deem attention of IDA, irrigation experts, stakeholders and partners are;

- ☞ Method and time of irrigation commodity harvest.
- ☞ Provision of improved and safe collection materials.
- ☞ Poor sanitation of products i.e. At collection centres, temporary

storage and farm gets etc. IDAs and irrigation extensionexperts should advise farmers on sanitation of products at various stage.

- ☞ Poor quality standardization,, sorting and grading harvest at farm gate to level the
- ☞ Pricing of commodities is not based on the agreed quality and poor incentive.
- ☞ Poor loading and unloading that leads product to destruction.
- ☞ Poor infrastructure and market facilities packing and semi processing services that can add value on the products is not sufficient.

5.4.5. Industrial Processing

Industrial processing is the chain at which majority of value adding operation is carried out. . Some of the operation carried out at industrial processing stages are: .

- ☞ Bulk Purchase of raw materials from whole sellers and retailers
- ☞ Transportation of the product to the industrial site
- ☞ Storing of the product based on first in first out /FIFO/systems.
- ☞ Re-grading of the product based on the standard quality set by the industry
- ☞ Let the product to be processed in the industry
- ☞ Grading and classification of the product based on the standard set
- ☞ Packing , distribution and promoting the product

Weak linkage of the value chain in Industral Processing

- ☞ Low capacity of agro-processing industries
- ☞ Surplusproduction of irrigation commodity is not enough to attract agricultural industries to processing.
- ☞ In consistent irrigation production and supply

- ☞ Excess supply over existing demand situation leads horticultural product price below break-even points.

- ☞ Due to absence, of developed agricultural industries surplus product supplied in excess of existing demand at peak harvest season will be either sold with discouraging price or disposed on the farm land and this situation discourage the producers. However, at the time of off-season supply of irrigated crop product go down compared to the market demand which in turn rise the price per unit of the product and this situation discourage consumers.

Perishable nature of irrigation product exacerbates the problem of untenable supply and unstable price prevalence. In the market, this situation leads to unsustainable irrigation development as farmers engaged in irrigation determine to be involved in irrigation based on the previous price per unit of irrigated horticulture product.

5.4.6. Distribution and Marketing of Irrigation development product

- Distribution

Distribution is the provision of irrigation development products for customers and to a place where demand is in place, but demand for irrigated product is not uniformly distributed. Production or farm site of irrigated product is located far away somewhere from urban settlement where demand for product. This situation necessitates installation of distribution services as important operation in the value chain of irrigation production system.Information where to distribute the product is precondition for the product to be transported from where it is produced to where it is consumed. Legalized and regulated broker services is essential in facilitating distribution services in linking potential buyers with potential suppliers like whole sellers and whole buyers. The major activities in the chain are;

- ☞ Collection and distribution of information to irrigation water users/ households, IWUA about;type of products, quantity of the products, quality of the products, potential buyers Where and when the product can be available

- ☞ Loading unloading site facilitation

- ☞ Temporary storage at farm gate to sort, grad, scaling, packing and loading to means of transport

- Marketing

Irrigated crop product marketing is carried at different level such as on farm site before harvest, farm gate after harvest, temporary storage site, after sorting and grading, whole sell at central market, supermarket, roadside marketing in the form of retailers. Some of the operation in marketing value chain are large volume sale at farm get or at farm

- Buyer, harvest the product and maintain the quality required at harvest level.

- Sorting is done at farm site.

- Transporting the product to the central market where retailers buy from the whole sellers.

- Some of the product is sold to super market where supper market is the last outlet and sold to the consumers.

- Weak link of marketing value chain

Weak link of chain is exacerbated by irrigation product market distorting intermediaries or brokers. Normal market operation is prevailing when demand and supply of market operated properly. Set fair price that enables producers and consumer's wellbeing. Some of the current drawbacks of irrigated commodity marketing are;

- ☞ There is not standard for irrigation products to set fair price that encourage producers and realize consumer welfare

- ☞ Price information flow problems

- ☞ Broker's service is not well regulated/ Suppliers and consumers are not adequately informed (Asymmetry of information)

- ☞ Inadequate and weak promotion and advertisement service
- ☞ inadequate public market facilities where daily sales are taking place to set fair price
- ☞ Inadequate regulatory system to the neighbouring countries such as Djibouti, Somalia and South Sudan
- ☞ Poor and inadequate transportation and marketing facilities
- ☞ Low integration among stakeholders involved in marketing of irrigation commodities

5.5. Value-Chain Strategy in Irrigated Agriculture

Emphasis has been given on a value chain framework to develop targeted irrigated crop commodities. Such a framework recognizes that value chain actors add value at different stages of the value chain and that individuals and organizations provide inputs/services to the value chain actors. Concerning irrigated agriculture, the key value chain actors are irrigated water users/ producers (I.e. IWUA, HHMI, community water pond users etc.), inputs suppliers, , traders and processors at various levels.

Strategic service providers include research and extension sectors that does technology development, capacity building, knowledge generation and dissemination.

Bureaus of Agriculture is involved in input supply and services e.g. supply of seeds, irrigation equipment, and other agricultural crop inputs. Involvement of communities, cooperatives, irrigated farmers and the private sector in producing inputs and providing services is also emerging. Region focuses on the need to improve the effectiveness of research and irrigation extension system to support the development of market-oriented irrigated crop commodity, and irrigation extension experts can carry out:

- ☞ Promoting the use of participatory, market driven, gender sensitive and sustainable irrigation-extension approaches for value-chain development
- ☞ Promoting the involvement of value chain actors (suppliers of inputs

and services) in the development process

- ☞ Promoting improved knowledge management approaches for identifying capturing, storing and sharing knowledge
- ☞ Supporting schemes, village and district level development of community, cooperative, farmer and private sector production and supply of inputs and provision of services
- ☞ Promoting linkages/dealership networks with value chain actors and service providers at regional, zonal and woreda level
- ☞ Promoting assessment, action, impact studies on value chain interventions of irrigated commodities and documenting of results and lessons learned to use for learning areas and to scale out beyond the project areas.

5.5.1. Participation and support Interventions on Potential Irrigated Commodity Value Chain Interventions

Irrigation extension experts promote value chain in irrigated agriculture by using innovation systems and value chain approaches, and maintain linkages with relevant stakeholders and value-chain actors in the regions. Innovations may consist of organizational, institutional and technological interventions. Following are potential irrigated commodity value-chain interventions;

Selected value chains

- ☞ Vegetables – onions, tomato, cabbages, carrots, potatoes etc.,
- ☞ Fruits – mango, avocado, papaya, banana, apple, plums, citrus etc.,
- ☞ Fodder – Grasses, legumes etc.,
- ☞ Cereals – Maize, sorghum, wheat, mallet barely, rice etc.

- Pulse and oil seed – soybean, mung bean
- Other

Producers/markets

- Producers – Farmers in irrigation SSI and MI schemes (not pre-selected)
- Markets – Individual households – Traders – Large scale fruit and vegetable growers – Supermarkets – Juice factories, bakery houses etc

Potential irrigated crop interventions-Irrigation extension should intervene in the following activities in the selected irrigated commodities

- On - farm water management
- Input supply and services
- Marketing/processing

Production interventions- to increase production and productivity of household micro irrigation users, IWUA, community water pond beneficiaries should;

- Distinguish between different farm types/systems and production interventions
- Improved/marketed demanded varieties
- Improved crop and water husbandry practices, including use of improved inputs/irrigation technologies and farm tools , planting schedules, post-harvest, quality
- Increased irrigated area and percentage of high value irrigated commodity

Crop varieties

- Fruits
  - Flesh/seed ratio – e.g. mango, avocado
  - flavour (e.g. all fruits)
  - Productivity (e.g. all fruits)
  - Early maturing – all fruits
  - Size, colour& shape

- Nutrition composition

- Vegetables
  - Onion vs shallot –
  - Shelf life
  - Size, colour& shape
  - Productivity (e.g. all vegetables)
  - Nutrition composition
- Fodder –
  - High value
  - Productivity
  - Size, colour& shape
- Cereal crops
  - Productivity
  - Nutrition composition
  - Purity percentage

Improved crop/water husbandry practices-The irrigation extension experts and IDA should advise farmers, IWUA on,

- Improved irrigated agronomic practices and application of technologies
- Soil fertility management
- Agro ecology
- Crop rotation (e.g. Mixed cropping, alley cropping, inter cropping etc.)
- Pest control
- Staggered planting
- Irrigation equipment/methods use and maintenance
- Post-harvest handling Water source, quality, and storage

Crop Input/service production interventions irrigation water users

- Seed multiplication e.g. Onion seed, potato seed, forage seed, etc , –
- Vegetable seedlings – onion, pepper
- Fruit seedling nurseries e.g. seedling multiplication, fruit nurseries, grafting and mother trees, Banana sucker

- ☞ Onion seed multiplication

Irrigation commodity input/service supply interventions

- ☞ Linkages between federal/regional agribusiness with village/district/ zonal level agri- businesses, - Irrigation equipment, Agro-chemicals etc.
- ☞ Linkages between federal/regional level suppliers of improved varieties with district level multipliers – Certification of producers of seed/seedlings

Processing and marketing interventions

- ☞ Improved marketing and processing of crop products by district/ zonal cooperatives and private entrepreneurs
- ☞ Introduction small scale processing and storage equipment
- ☞ Bulking produce for marketing
- ☞ Formation of collective structures marketing for producers (formal and informal)
- ☞ Contract farming thru linkages

Processing and marketing interventions

- ☞ Linkages between federal/regional agribusinesses with district level processors and traders –
- ☞ Fruit and vegetable whole sale – Selected supermarkets
- ☞ Linkages between district/village level service providers and federal level service institutions – Crop prices,–, Information, – Associations (horticulture) and projects – Quality – Bureau of quality and standards/EIAR

5.5.2. Facilitating Services

Service facilities are important factors to access irrigated commodity consumers. Services required to access irrigation commodities to consumers are:

Transport facility

Transport is a means by which product is transported from where it is produced to the market and then to the consumers table. Most common transport of irrigated product from farm site to the local market is animal transport like donkey and horse and sometimes transported by labor. From local market to the central market. In such a situation, the extension exports and IDA should

advice farmers' timely collection and using proper packing materials and use of proper transportation.

Storage

Most irrigated crop products are perishable. Time between harvest and consumption of these products requests to have appropriate storage to keep the product natural qualities not lose its value. The most common at farm gate is under temporary shelf, storing in hole and covering with soil in case of potatoes etc. In same case, few market centers first come first out system to shorten the time the product stay in market shelf. In general, the most pressing issues that hinder product quality are storage services.

Processing

Irrigated commodities processing service industries are generally at infant stage. This requires key attention. To ensure sustainable supply and irrigated crop price regulation.

Packing

Packing and labeling of processed goods is important operation to add value to irrigated horticultural/ cereal products. This will improve trust among producers and consumers, quality improvement through by creating positive competition, branding, promotion etc.

Exporting

Export of irrigated horticultural, cereal, pulse, oil seed commodities are generally not at scale. This entail significant work on value addition at different forms is required. Irrigation extension should advice irrigation farmers to produce at scale.

Dealers

Agro-dealers providing information services for potential buyers and supplies. They provide information about the type, amount and where the product is, find.

Communication

Communication is vital service required to link buyers with potential sellers. Mostly brokers and agro dealers in the rural areas carry this activity. Market-oriented extension system emphasized communication to potential buyers using mobile phone, TV and radios.

Annex E&F example of important Operation of Irrigated crops valuechain on selected crops and cost benefit analysis sample

5.6. Commercial Irrigation Agriculture

Smallholder farmers face a number of constraints such as lack of information, finance, and risks that limit their participation in the commercialization process and negatively affect their income. Those constraints are associated with the apparent market and institutional capacity. Therefore, linking smallholder irrigation farmers to the market economy remains one of the major irrigation development challenge. To help smallholders participate in the market, contract farming has emerged as one of the best irrigation extension approaches that promotes the commercialization of smallholder farmers.

5.7. Contract farming approach

In contract farming, an agreement is made between IWUA or individual households, large-scale irrigation producer farmers and large volume buyer or agribusiness firms (processors, exporters, and traders) in advance for a specific quantity, quality, and date of delivery of an irrigated produces or commodity at a predetermined price. In such agreements, the buyers /agribusiness firm provides the IWUA or irrigation farmer with technical assistance, farm inputs, credit, and offers a guaranteed price while the firm receives a guaranteed steady supply of irrigated produce/commodities in accordance with the contract terms.

Also benefit from lower transaction costs, including lower search and negotiation costs, often get support on access to high quality and/or cheaper inputs, tools and technology, access to relevant knowledge, information and skills (agricultural extension), access to finance in the form of an advance or a loan. The approach at wider scale will strengthen public private partnership (PPP) link.

In order to promote the development of competitive and sustainable contract farming schemes that are beneficial to smallholder farmers the irrigation extension play key roles such as:

Facilitation of legal permission through contract farming arrangements

- Promote collective action that are working with IWUA, farmers' groups or cooperatives
- Promote Public-Private Partnerships (PPP) in research, extension, and investment ventures
- Empower SSI & MI irrigation producers

- Encourage public and private sectors work together to develop grades and standards for irrigated agriculture commodities
- Facilitate competition among agribusiness companies

5.7.1. Types of contractal farming on Irrigation development

Approaches of contractual arrangements varies according to the depth and complexity of the provisions in each of the following three areas

☞ **Market specification contract approach**

In this approach, the transaction between farmers and contractors (agribusiness firms) is based on an agreement stipulating the product to be produced, quality attributes, and finally time and location of delivery.

Such approach is more applicable in a situation where there is a need for market coordination and yet farmers do not have input constraint and the buyer is not concerned about production methods. This type of contract approach is perhaps informal or formal. Under this contract approach, the farmer/IWUA retains full control of all management decisions so that he bears most of the production risk by his own.

☞ **Resource-providing contract approach**

In a resource-providing contract approach, the contractor/buyer arranges support provisions in the form of key farm inputs and technical assistance on credit basis in addition to the marketing arrangement. The cost of credit is often recovered upon the delivery of farm product. This approach reduces transaction and input cost for the farmers/IWUA while it ensured irrigation produces/ commodity supply in terms of volume and quality for the buyer/firm. It is likely to be formal because of the need to specify the terms of the input credit.

☞ **Production-management contract approach**

The production management contract is a combination of the market and

resource specification contract approaches. The buyer/contractor makes commitments in the form of support provisions such as farm inputs advance, technical inputs, and managerial control. The production-management contract approach specifies the details of management practices to be followed, for example, planting date, fertilizer and field chemical application, and harvesting time. This type of contract is commonly used in cases where there is an introduction of a new irrigated agricultural technology and product quality and food safety are the primary motives.

5.7.2. Steps of developing contract farming systems

- Decision to develop a CF scheme
- development of a CF capacity development plan
- Development of a CF business plan
- Negotiation and acceptance of CF contract
- Start-up of CF field operations
- Monitoring, feedback and learning
- Continuous improvement for sustainability
- Generic growth through up- scaling

5.7.3. Systems and step in out grower marketing

Although there are various condition both for the out grower farmer and the buyer the first condition must be profitable for both sides. It is necessary to explore the following to be profitable.

➢ **Identify profitable market** - The buyer needs to make sure that the market seeks and continues and longtime provision and profit. Farmers need to pay attention to problems that may lead to their market oriented production practices.

➢ **Physical and social environment**

☞ For a market to continue and strengthen the production land, weather conditions, soil fertility, water resources, market demand, andcommodity merit should be clearly known.

- Market assessment and market research. The farmer should identify common farming practices before any activity. These would help to understand a test of the quality and marginality of the product.
    - Make sure that the local environment is suitable for the produce.
    - Power sources to increase the value of a product, such as electricity and water;(in the case of large production and storage)
    - Ensuring adequate production land and property certifications;
    - Input and availability of resources
    - Assessing the situation of the community, including the traditional viewpoint and experience.
- Government Support / Verification - The government's role in supporting small-scale farmers is crucial in establishing effective and legal linkage between the stakeholders. Therefore, it is important to facilitate the creation of a suitable and legally binding agreement between the government and the regulatory authorities, regulations and implementation guidelines, the strengthening of research and extension services, and the establishment of basic infrastructure in the manufacturing sector. Gender Box 4. Irrigated crop value chin through Agricultural Commodity Approach.

Gender Box-4:-Intgrated value chain on products of irrigation development

What are the issues of gender inequity in integrated crops Value chain?

Women farmers, in both female and male-headed households, participate in various value chains but women farmers' involvements are less visible. Their contributions to the production of high value crops are not sufficiently acknowledged.

Due to traditional gender roles and low educational level, women often concentrate in labor intensive and low value added activities along the nodes of the VC

Women have no adequate access to production resources like input, credit, land etc. Or face constraints in accessing property, because of discriminatory laws/practices

Cultural norms and gender stereotypes hinder women's access to decision-making places and spaces in the VC, insufficient representation and participation of women in decision-making at all levels , include lack of leadership and representation, Insufficient networking/communication between organizations working for the promotion of women's rights benefits from the VC,Women have limited timely and appropriate market information and facing barriers for improving quantity and quality of their production. This is due to their low educational level, low awareness on the operating environment in general, daily schedules, their relative isolation and restricted mobility outside the home because of norms of "female respectability", but also linked to the overall environment such as gender blind information systems and inadequate opportunities to share information on good practices, successful experiences, etc.

How can the Gender issues be addressed?

Map the participation of men and women in the value chain, identify the gender-based constraints and opportunities and design solutions to remove gender-based constraint.

Gender based analysis focuses on understanding the difference in gender (men and women's) roles, activities, needs and interests in VC should to take in to account and it require the use of disaggregated, quantitative and qualitative data by gender and knowledge

Improve women's access to resources and opportunities throughout different segments of the value chain

Ensure women's access to productive resources/assets and opportunities through the application of equitable/ non-discriminatory laws and regulations and affirmative actions

Change mentalities in favor of women's leadership and develop women's skills (leadership, advocacy-lobbying) and increase their voice in VC processes

Foster institutional and organizational development/strengthening of female producers , cooperatives, Unions/ Federations and their strategic linkages/networking with organizations/institutions working for the promotion of women's rights cooperatives, Unions/Federations and their strategic linkages/networking with organizations/ institutions working for the promotion of women's rights

Ensure representation and participation of female producer/ marketers/processors in fora and ensure that women's voices can be heard in VC stakeholder platforms/meetings

Improve gender sensitive business agreements in terms of packaging & handling technologies, schedules and working conditions

Improve bottom up organization and representation of female producer/marketer/workers and institutionalization of their participation in platforms/for a

Understand men's and women's access to information on market needs and requirements and improve Women's access to supply and market information

Understand constraints faced by women producers to access markets and find solutions tailored to their needs

Establish gender sensitive information systems (mechanisms and content)

Improve access for women producers to market information through networks

Improve access to knowledge, successful experiences and good practices for women in VC

What will be the benefits when gender issues are addresse

Value chain plan addresses the needs of both smallholder male and female farmers by providing them with a structured mechanism to integrate their input, needs and aspiration into the process of VC eventually will led to greater production and maximum benefit

VC development is more effective and sustainable when women are getting equal access and control over productive resources

Enhancing women leadership capacity and women's organizations in the value chain can influence the gender equality agenda

Improved quality and quantity of production and maximize women benefits from the VC.

CHAPTER-6
IRRIGATION EXTENSION DEVELOPMENT TRAINING

One of the most important aspects of developing strong ways of winning is the training planning. Planning is leveraged time- 20 minutes of planning per day can improve your productivity immensely. Affording your time to plan will pay off in the future. You will make sure that you are staying on track with your goals and you can ensure that you become more task oriented.

Planning provides the framework for informed decision-making - by planning what you are going to do you will be establishing a framework and will be able to tick off items from your "to do" list as you go along. This is extremely effective way to manage any tasks that you have.

Planning reduces risk management. If you plan effectively, there is less likelihood of any critical issues coming up. However, it is important to be prepared for unforeseen situations occurring and be prepared to sit back and plan again around any issues.

Planning allows focus and personal energy direction. As you can appreciate, by establishing a focus through planning you will be able to channel your energy positively into reaching an outcome. Having a course of direction will assist you in accomplishing your tasks in a timelier and efficient manner. It helps to eliminate: A) bad habits, and B) fear of failure. If you stick to a plan you are more likely to break some bad habits, you might have (i.e. surfing around the net without really accomplishing anything). By establishing a plan and sticking to it, you are less likely to fail.

Planning allows you to set priorities and focus on what is important. Even within your plan, you can prioritize your tasks so that items you think are more important than others can be action accordingly. You need to discover what is important to you and sometimes go through a few boring tasks in order to get to the exciting end result. Effective planning will have a HUGE impact on breaking bad habits you might have and should lead to successful task management while doing irrigation extension planning.

6.1. Purpose of Irrigation-Extension Training

Good irrigation extension programs do not just happen. They are the result of careful consideration as to why the organization exists and what its members want to accomplish. The programs offered by your organization project an image, which will either attract new people or turn them away. Irrigation extension program planning is deciding what needs to be done, and who does what, when and where. The two

key elements in successful program planning are the program or project itself and the interest and involvement of group members. Following are seven steps, which will help your organization, choose and plan a successful program that will interest and involve the membership.

Training is one of many possible approaches to capacity building. Extension training is a methodology that strengthens an individual or organization's ability to perform well and meet its objectives. Thus 'capacity' can be enhanced through a variety of means including better policy formulation, by working more transparently with partners, through more efficient financial management, or through mentoring and coaching support – to name but a few. It follows; therefore, that training is not always the answer to poor performance and its place in the broader spectrum of possibilities.
Within an organizational context, training focuses on 'human resource development' – to enable the organization to function better. This is because training contributes not only to a constantly improving staff but also because it improves motivation and the sense of being valued.

6.1.1. Goals of Irrigation Extension Training

Irrigation Extension has very clear purpose that relates to

- improvement of performance of farmers to improve their irrigation production and productivity,
- Provide irrigation problem solving new irrigation techniques and technologies
- enhance the scaling up of improved technologies and best practices to double the production and productivity of irrigation agriculture
- Encourage the collection, compilation and dissemination of improved technologies and best practices,
- Enhance the implementation scaling up of best practices, identifying the skill gaps to practical training to technical staff and farmers,
- To conduct experience sharing among to improve the skills and understanding of them,
- To introduce new agricultural technologies to the farming communities and encourage their utilization

- ☞ to create strong linkage among agricultural development partners to provide integrated agricultural extension services for the farming communities

- ☞ To encourage women's and youth's participation in rural development economically to improve their capacity

The concept of extension training program planning is important to consider in the entire program.It is regarded as an integral and important dimension to a systematized approach of solving issues of knowledge, skill and attitude in a certain community to bring about positive behavioral change. Training program planning is a dynamic process of act of reflections, thinking, and choosing among various options regarding the purpose and the strategies to attain the intended goals and objectives. Extension training planning provides an opportunity for people to involve and contribute in the process planning and develop ownership and building trust, resource mobilization etc. Therefore, it is understood that extension training planning has become an increasingly accepted practice.

6.1.2. Irrigation Extension Training Cycle

Training is one of many possible approaches to capacity building. However, Training is not always the answer to poor performance and its place in the broader spectrum of possibilities. It is an appropriate methodology for training needs analysis, session planning, training materials design and development and effective training analysis report writing. The five parts of a training cycle:

Part I: Training Needs Analysis
Part II: Determining training objective content, and learning experiences, Session Planning
Part III: Training Materials Design and Development
Part IV: Training Delivery (implementation of training)
Part V: Evaluation of the training

6.1.3. Extension Training Processes

Extension training process has been conceived as a process consisting of three phases, viz. pre-training, training and post- training.

Pre-training

This is preparatory phase prior to actual extension training. It involves planning of training. A training organization has to assess individual need for extension training

and decide appropriate training content as well as methods. Arrangements to select participants, inform about training details and make necessary preparations are completed during this phase

Training

The actual implementation of training is done in this phase according to plans drawn before. There are many different activities executed simultaneously like reception of trainees, lodging, and boarding, organization of instruction, field trip and monitoring. Due care needs to be taken to create a relaxed atmosphere for the participants to interact freely and practice new skills. A good rapport with participants, personal attention and feedback ensure interests and enthusiasm of participants. This can be indicated through daily evaluation on the overall training.

Post-training

Training does not really end with a course. Post-training test, measurement of impact and follow-up of participants at work place are important elements of good training. Good organizations prepare report and put efforts to bring improvements in training based on evaluation.

6.2. Training Needs Assessment (TNA)

A training need is said to exist when a gap between the work performance of an individual or organization and a desired level of competency is perceived. This suggests that a training need can be described as a set of specific skills, knowledge, and attitudes, which are needed by individuals in a given organization or occupational category in order to perform a particular job or task more efficiently.

Irrigation Extension Training Needs Assessment refers to the process whereby such training needs are identified prioritized, and selected for specific action as part of irrigation-extension training program. The first step of the irrigation-extension training cycle is the identification of training needs. Training should never be provided unless needs have been clearly analyzed and identified. Once a problem has been identified, a number of solutions may exist. It is very important, however, to realize that training is not always the answer. Whenever a deficiency of knowledge, skill or attitude exists, it is all too easy to fall into the trap of thinking that some form of formal training program is necessary. It is often better to decide what we must not train and or need not train, in order to determine what we must train/teach. The fact is that training has high costs. Irrigation staffs (men and women) are taken away from productive work and time and money are spent on achieving objectives, which might have been managed more cost-effectively.

In the case of a new irrigation-extension training program, TNA is necessary at an early stage in the process of planning. A particular area farmers or irrigation beneficiaries use it mainly for improving, modifying and adapting new irrigation techniques and technologies. TNA is an integral part of the training cycle, and an indispensable element in the overall planning process.
Thus while the overall objective of identifying and bridging the "gap" between "what is "and "what should be" may be the common denominator of most TNA programs, there is considerable variation in the way its undertakings are conceived and implemented.

A systematic needs assessment is a comprehensive process involving:

- Deciding the target population (beneficiaries)
- Defining and identifying needs
- Measuring competency short comings
- Prioritizing between them
- Setting training objectives in the light of assessment findings

6.2.1.Purpose of Irrigation Development Training Needs Assessment

At the most general revel TNA helps extension IDAs and irrigation experts decide which problems to address through training and how to address them. However, TNA also performs other specific functions within the training cycle:

- It provides the baseline data upon which all extension planning decisions are made
- It assists the setting up of a results-oriented extension training program
- Needs assessment improves training effectiveness through better targeting. It sorts out problems into those, which require a training solution,&those that need other types of attention. It also identifies individuals who need training and the type of training they require
- It helps to avoid some of the most common mistakes in irrigation extension training, e.g. Spending unnecessary time on teaching difficult crop water requirement mathematical calculations/ too detail soil

chemistry or complex hydraulic engineering but relatively unimportant

- ☞ It helps to plan highly essential and easy to teach contents/ material and avoid what trainees already know
- ☞ TNA provides valuable insights and leads in respect of the design, development and delivery of training programs
    - o Type of training to be undertaken
    - o The location of training
    - o Schedule of training activities
    - o Resource requirements
    - o Selection, preparation and adaptation of training materials and methods

6.2.2. Conduct Training Needs Assessment

One methodology is to follow four basic steps in carrying out a TNA:

- o Step One: Perform a gap analysis
- o Step Two: Identify priorities and importance
- o Step Three: Identify causes of performance problems and/or opportunities
- o Step Four: Identify possible solutions and growth opportunities

Step one- Gap Analysis

The first step in gap analysis is to check actual irrigation extension performance against objectives. This is done in two parts:

- ☞ Analyse current situation – determine the current state of knowledge, skills, and irrigation extension activities in the context of institutional goals and constraints. (Established through organizational assessment)
- ☞ Define desired situation – this focuses on the necessary(required) irrigation extension job tasks/standards as well as the skills, knowledge and abilities needed to accomplish irrigation extension successfully. We

must distinguish between actual and perceived needs.

As indicated earlier, needs may be conceived of as a gap between an existing situation (What is) and another, under 'ideal' or' desirable' conditions (what should be). This relationship can be illustrated as below:

What ought to be- Desirable Situation,
Need = difference, shortfall, Deficiency
What is - Actual situation

Note

- ☞ Are we fitting irrigation extension staffs/farmers to the extension job or fitting the extension job to the irrigation extension staffs/farmers? The former can be done by better selection or provision of training the latter is meant redesign or providing extension job aids. e.g. Job Embedded Support(JES)

- ☞ The distinction is also a useful reminder of the fact that not all perceived problems in irrigation extension is the performance gaps are due to lack of training. E.g. it is may be caused by factors such as internal conflicts, low morale, etc. Attributing the right gap to appropriate training needs thus forms an important part of challenge in TNA.

6.2.3. Understanding Training Need Levels

Some serious problems arise at the level of measuring gap analysis is partly difficulties in establishing the base-line or existing levels of knowledge, attitude, skills for individuals concerned, and partly in defining 'desirable' standards for trainers to achieve. To illustrate these difficulties, the following schematic outline is used to describe 5-levels of attainment. Thus, IDAs, irrigation experts and other concerned irrigation development parties can apply this tool.

Table- 1:- Level of Needs

#	Existing level of knowledge/skill	Definition
1	Nil	Knowledge/skill level practically absent or negligible regarding some subjects
2	Deficiency	Some general awareness, but insufficient knowledge/skill
3	Sufficiency	Fairly adequate knowledge or skill to perform, but short of efficient performance
4	Precision performance	The required level to achieve precision & consistency in performance
5	Perfection	Combining precision with speed in performance: the ' ideal' level of attainment

6.3. Steps to Conduct Training Needs Assessment

Step-1: Gap Analysis

The first step is to check the actual performance of farmers against existing standards, or to set new standards. There are two parts to this:

Current Situation- We must determine the current state of skills, knowledge, and abilities of farmers, IDA and irrigation extension experts particularly those involved in SSI and MI schemes.

Desired or Necessary Situation- We must identify the desired or necessary conditions for farmers and their personal success. This analysis focuses on the necessary job tasks/standards, as well as the skills, knowledge and abilities needed to accomplish these successfully. It is important that we identify the critical tasks necessary, and not just observe current practices in the irrigation schemes. As IDAs and Irrigation extension expert, we also must distinguish the actual needs of farmers from their perceived needs -- their wants. The "gap" between the current and the necessary will identify their needs, purposes and objectives.

Here are some questions to ask to determine where training and development may be useful in providing solutions:

- ☞ are there problems in the schemes, MI or community water pond that might be solved by training or other human resource development activities

- ☞ Impending change- are there problems, which do not currently exist but are likely due to changes, such as new processes and equipment, outside competition and/or changes in staffing

- ☞ Opportunities- Could farmers gain a competitive edge by taking advantage of new technologies, training programs

- ☞ Strengths- how can farmers take advantage of their own strengths, as opposed to reacting to their weaknesses? Are there opportunities to apply skills to these areas

- ☞ New directions- could farmers take a proactive approach, applying hands-on to move their ability to new levels of performance? For example, could farmers-team building and related activities help improve their productivity

Mandated training- are there internal or external forces dictating that training will take place? Are there policies or management decisions that might dictate the implementation of some extension programs? Are there governmental mandates to which we must comply?

Step 2.Identify Priorities and Importance

The first step should have produced a list of needs for training and development of farmers engaged in SSI and MI schemes or other irrigation interventions. We must examine these in view of their importance to our organizational goals, realities and constraints. We must determine if the identified needs are real, if they are worth addressing, and specify their importance and urgency in view of our organizational needs and requirements.

Step 3. Identify Causes of Performance Problems and/or Opportunities

Now that we have prioritized and focused on critical farmer's needs, we will next identify specific problem areas and opportunities available within the schemes. We must know what farmers' performance requirements are, if appropriate solutions are applied. We should ask two questions for every identified need:

- ☞ Are farmers, IDA, irrigation experts etc., doing their jobs effectively?

- ☞ Do they know how to do their jobs?

This will require detailed investigation and analysis of farmers, their jobs, their performances- both for the current situation and in preparation for the future.

Step 4. Identify Possible Solutions and Growth Opportunities

If farmers, IDAs, irrigation experts are doing their jobs effectively, then perhaps we should leave well enough alone. ("If it isn't broken, don't fix it.") However, some training and/or other interventions might be called for if it is important enough to move farmers, IDAs, irrigation experts and their performance in new directions. However, if farmers, IDAs, irrigation experts are not doing their jobs effectively, then training may be the solution if there is indeed a knowledge problem. It may also require interventions by extension expert/IDA in strategic planning, organization restructuring, performance management and/or effective team building.

6.4. Identify Farmers Training Needs

A training need exists where there is a difference between "what is" and "what should be" among an individual or a group. The difference can be terms of knowledge, attitudes or skills that trainees need to more effectively perform their jobs. The need analysis process is divided into two distinct procedural phases, these are:

1. Job Analysis (identifying "what should be") involves
    - Identifying activity areas;
    - Task breakdown or division of activity areas into specific tasks;
    - Task analysis or division of tasks into specific actions;
    - Division of action into specific steps
2. Gap Analysis (identifying "what is") involves
    - Trainee skill estimation
    - Comparing "what is" with "what should be"

6.4.1. Conducting Job Analysis

A job analysis involves dissecting a job or major work event into its component parts that include number of different general activity areas. Each activity area consists of a number of specific tasks, which must performed. Analysis of each specific task identifies a number of actions required to complete it. Analysis of each action identifies a number of individual steps, which are involved after the components parts have been identified. It is necessary to determine the frequency, relative importance and learning difficulty for each component that has been identified. Through the process of a set of following worksheets, help design to assist the event organizer to document and analyze each component:

I. Activity Breakdown Worksheet

II. Task Breakdown Worksheet

III. Action/Step Listing Worksheet

IV. Action Analysis Worksheet

V. Step Analysis Worksheet

Blank worksheets are shown at the end of this section. If event organizer/ trainer decides to do job analysis, photocopies of the worksheets can be made. Identification and analysis of activity areas and tasks is used to:

- ☞ Determine what task are required in the job
- ☞ Determine for which tasks it is the most important to ensure adequate ability
- ☞ Identification and analysis of actions and steps is used to:Identify the particular skills and knowledgeable required to perform a task
- ☞ Determine how the training course should be developed - what the content should be and how much time is required for each part of the course.

Following is an example of this process: Note: For ease of understanding of the steps of the training, the sentences are phrases in active voice from this section. Bold color are identified knowledge and skill gab areas.

Table- 3- Completed worksheet (sample)

JOB	ACTIVITY AREAS	TASKS (Tasks)	ACTIONS	STEPS
Vegetable Farmer	Site selection Land preparation Selection of seeds Nursery preparation Sowing Nursery maintenance Transplanting Water management Fertilizing Weeding **Pest and disease control** Harvesting/ processing	Pest identification Pest scouting Disease identification Selecting control method Determining quantities to use Determining cost-effectiveness **Using a knapsack sprayer** Assessing effects of control	(Actions) Checking equipment Calibration Mixing Protection **Using sprayer** Finishing	(Steps) Pressure control Pace/ speed Nozzle height Coverage area

Four approaches can be used to analyze the jobs farmer do. The best way is to have farmers describe the activity areas, tasks, actions and steps required in performing their jobs. This can be done through:

- Meeting held with group of farmers
- Observations and interviews conducted with individual farmersOther approaches are
- Submitting tentative lists of activity areas, tasks, actions and steps to farmers or DAs for their scrutiny/agreement
- Having SMS/experts identify and list activity areas and critical tasks;
- Action and steps (this is most efficient but least accurate approach).

Determining Activity Areas: In order to make a qualitative judgment of relative importance of the activity, the first step of job analysis is to identify all the activity areas of the job that is included in the list. Following is the systematic procedure:

Step 1. Take a "Job Analysis Worksheet" and write the name of job at the top of each of these forms will be used for breaking down and analyzing each of the most critical job tasks areas identified in the job analysis.

Step 2. List all the component parts or activity areas of the job on the Job Analysis Worksheet. This has to be done by interviewing the farmer who has the job been analyzed.

Step 3. Write one activity area on each line of the "Job Analysis Worksheet".

Step 4. Determine how frequently work is performed in each activity area. Use following scale:

1. Seldom
2. Occasionally
3. Daily
4. Weekly
5. Monthly

Step 5. Determine the relative importance of each task area. Use the following scale:

1 = marginally important

2 = moderately important

3 = extremely important

Step 6. Estimate the difficulty of learning to perform the work required in each activity area. Use the following scale:

1 = easy

2 = moderately difficult

3 = very difficult

4 = extremely difficult

Step7. Add the total score for each activity area by simply adding the scores for frequency, importance and learning difficulty. Record the sum or total for each activity area in the appropriate row of the Job Analysis Worksheet.

Completed Job Analysis Worksheet: The following is an example of a completed Job Analysis for the job 'vegetable farmer':

Job: Vegetable frame

Table- 4 - Completed Job Analysis

Activity Area	Frequency Performed (A)	Importance (B)	Learning Difficulty (C)	Total
Site selection	2	1	2	5
Planning	2	3	3	8
Land preparation	2	2	2	6
Selection of seeds	2	2	1	5
Nursery preparation	2	2	2	6
Sowing	2	3	1	6
Nursery maintenance	4	2	1	7
Transplanting	2	3	1	6
Water management	5	2	3	10
Fertilizer application	3	3	3	9
Weeding	3	2	1	6
Pest and disease control	4	3	4	11
Harvesting/ processing	1	3	2	6

Legends:2

A	B	C
1. Seldom	1. Marginally	1. Easy
2. Occasional	2. Important moderately important	2.Moderate difficult
3. Weekly to monthly	3. Extremely important	3.Very difficult
4. Daily to weekly		4.Extremely difficult
5. Daily		

From the scores on Job Analysis Worksheet we can see that 'Pest and Disease control' is an important activity area. It is important because it is (A) performed frequently that is daily to weekly, (B) it is extremely important, and (C) it is extremely difficult. Using this scoring process, it helps to focus on limited training resources on the job activity areas, which is most critical. Those activity areas with the highest total scores will be priority elements for training if they correlate with the gap analysis. Find job analysis worksheet format on annex G.

Task Breakdown: Task breakdown involves dissecting activity areas into their component parts or tasks. Each activity area has a number of tasks within it. The process of Task breakdown is very similar to the Job Analysis process. Find Sample task break down work sheet on annex H.

- ***Step 1.*** Take several "Task Breakdown Worksheets" and write the name of on Activity area at the top of each. These activities should be ones that you identified for the job analysis worksheets as having high scores. Each of these forms will be used for breaking down and analyzing each of the most critical job activity areas identified in the job analysis.

- ***Step 2.*** Identify the entire specific contained in the activity area. Write one task on each line of "Task Breakdown Worksheet". Again, you should do this by interviewing a person who has the job being analyzed.

- ***Step 3-7.*** Determine the frequency, relative importance & learning difficulty for each task using same scoring system as before, and sum the scores.

The following is an example of the task breakdown for the 'Pest and Disease control' task area of the job 'Vegetable Farmer'. The task area 'Pest and Disease control' involves several different tasks.

Completed Task Breakdown Worksheet

Job: Vegetable Farmer

Activity Area: Pest and disease control

Table- 5 - Completed Task Breakdown worksheet

TASK	Frequency Performed (A)	Importance (B)	Learning Difficulty (C)	Total
Pest identification	4	3	1	8
Pest counting	2	2	2	6
Disease identification	3	3	2	8
Selected control methods	2	2	1	5
Selected pesticides	2	3	2	7
Determine quantities to use	2	3	2	7
Determine cost-effectiveness	2	2	4	8
Using knapsack sprayer	3	3	3	9
Assess effects of control	3	2	3	8
Protection (safety materials)				

Legends

A	B	C
1. Seldom	1. Marginally	1. Easy
2. Occasional	2. Important moderately important	2.Moderate difficult
3. Weekly to monthly	3. Extremely important	3.Very difficult
4. Daily to weekly		4.Extremely difficult
5. Daily		

From the scores on Task Breakdown Worksheet we can see that 'Using a knapsack Sprayer' is an important action. Using this scoring process helps to focus on limited resources on the tasks, which are most critical. Those tasks with the highest total scores will be priority elements for training if they correlate with the gap analysis.

Task Analysis: Using Job Analysis and Task Breakdown procedures we are able to identify all the individual tasks required to do the job and determine the relative importance of each. By comparing this information to the information obtained through 'Gap analysis' we should know what tasks training should focus on. We must now take each important task and break it down into all the individual actions that are requested to accomplish the task. This process is called task analysis. Task analysis is a necessary part of planning a practical training. It will be easier to understand what is meant by task analysis if we distinguish between skills, tasks and actions as follows:

- A skill is the ability to carry out a task
- A task is a job-related activity with a clearly definable purpose
- An action is a component part of a task

Task analysis can be defined as the identification, ordering and examination of all actions, which make up a given task; the results of task analysis are used to plan and conduct training aimed at development of skills. Before starting a task analysis, the trainer must be sure he/she knows what the task is. He/she can make this clear by writing down the following things:

- The output of the task
- Who carries it out
- The circumstances under, which the task is carried out.

If writing the things down does not clarify what the task is, the trainer should ask himself/herself- is this perhaps two or more tasks? Having sorted out the nature of the task, the trainer should check that it is relevant to the job of the person (farmer) being trained. Once the task is clearly identified, it is necessary to identify and put in order all the actions, which make up the task. This can only be done by careful observation of somebody who is already skilled in that task. Do

not try to do this form your memory. You will certainly miss some of actions. As you watch the person carrying out the task, divide the activity into the smallest possible steps; the more detailed the analysis is, the more useful it will be when you come to conduct the training. Once the analysis is complete, it should be written down. You can do this using an Action/Steps Listing Worksheet. Find action step listing worksheet sample format on annex I.

The following is an example of the action/step list for the task 'Using knapsack sprayer':

Completed Action/Step Listing Worksheet

Job: Vegetable Farmer; Activity Area: Pest and Disease Control

Task: Using a knapsack sprayer

Table- 6 - Completed Action/ Step Listing Worksheet

ACTION		STEPS		
Action 1	Checking equipment	Steps	1a	Clean tank
			1b	Examine/clean nozzle
			1c	Pressure test
Action 2	Calibration	Steps	2a	Determine area to be sprayed
			2b	Mark and measure test area
			2c	Test run with water
			2d	Calculate water used for test area
			2e	Calculate number of tanks for total area
			2f	Read label
			2g	Calculate chemical per tank
Action 3	Mixing	Steps	3a	Safety precautions
			3b	Suitable measuring instrument
			3c	Accurately of measurement
			3d	Stirring
Action 4	Protection	Steps	4a	Hands
			4b	Face and head
			4c	Feet
			4d	Body
Action 5	Using sprayer	Steps	5a	Pressure control
			5b	Pace/speed
			5c	Nozzle height/angle
			5d	Coverage
Action 6	Finishing	Steps	6a	Disposal of waste
			6b	Cleaning sprayer
			6c	Storing chemical
			6d	Washing self

Action Analysis: Now that you have decided the tasks, for which it is important to provide training, (in our example: 'Using a knapsack sprayer'), you should now analyze the relative importance of each 'action' you have identified that is required to perform the task. This will help to focus training time and attention on the more difficult and important actions. This analysis is again similar to what you have done so far in evaluating activity areas and tasks. However, this time all individual actions will be required each time the task is carried out so we do not need to consider 'frequency' in our assessment. Find Action Analysis work sheet sample on annex J.

Step 1. Take several "Action Worksheets" and write the name of a task at the top of each. The tasks should be the ones that you identified from the task analysis worksheet as having high scores. Each of these forms will be used for breaking down and analyzing each of the tasks identified in the Task Breakdown.

Step2. Identify all the specific actions required to perform the task. Write one action on each line of the "Action Breakdown Worksheet". Again, you should do this by interviewing a person who has the job being analyzed.

Step 3-7. Determine the frequency, relative importance and learning difficulty for each task using the same scoring system as before, and sum the scores.

The following is an example of action analysis for the actions required in completing the task' Using a knapsack sprayer' from the 'Pest and Disease Control' activity area of the job 'vegetable farmer'.

Completed Action Analysis Worksheet

Job: Vegetable Farmer

Activity Area: Pest and disease control

Task: Using a knapsack sprayer

Table- 7- Completed Action Analysis worksheet

ACTION	Importance (A)	Learning Difficulty (B)	Total
Checking equipment	3	2	5
Calibration	3	4	7
Mixing	3	1	4
Protection	3	1	4
Using sprayer	3	3	6
Finishing	3	1	4

Legend:

(A)	(B)
1 = marginally important	1 = easy
2 = moderately important	2 = moderately difficult
3 = extremely important	3 = very difficult
	4 = extremely difficult

This analysis allows you to identify, which actions will require the most teaching time. That is those, which are the most difficult to learn. In this example, all actions are important but they vary in learning difficulty. We can see that 'Calibration' and 'using the sprayer' will take more time to learn and will require more lesson preparation and teaching skills.

Step Analysis

If there are large number of steps required to complete an action it will be beneficial to analyze the learning difficulty of each step. This will help in course planning. This analysis is again similar to what you have done so far in assessing activity areas, tasks and actions. However, this time all individual steps will be required to complete the action so it is only necessary to assess learning difficulty.Find steep analysis worksheet sample on annex K.

Step1. Take a "Step Analysis Worksheet" and write the name of the action at the top.

Step2. List all the steps required to complete the action. Write one-step on each line of the "Step Analysis Worksheet".

Step3. Estimate the difficulty of learning to perform the work required in each

step. Use the following scale.

1 = easy

2 = moderately difficult

3 = very difficult

4 = extremely difficult

The following is an example of Step analysis for Action 'Using sprayer', contained in the Task 'Using a knapsack sprayer', from the Activity Area 'Pest and Disease control', of the job 'vegetable farmer'.

Completed Step Analysis Worksheet

Job: Vegetable farmer

Activity Area: Pest and disease control

Task: Using a knapsack sprayer

Action: Using sprayer

Table- 8- Completed Step Analysis Worksheet

Step	Learning Difficulty
Pressure control	3
Pace/speed	2
Nozzle height	2
Coverage	3

Legend: 1 = Easy

2 = Moderately difficult

3 = Very difficult

4 = Extremely difficult

This information will help in training course and lesson planning.

Annex J. blank worksheet

This information will help in training course and lesson planning.

6.4.2. Conducting a Gap Analysis

It is to determine to what extent the trainee can currently perform the tasks required. What the trainee, the farmer, is currently able to do must be compared to what is required to adequately perform the task. There is a "gap" when the task requires more skills and knowledge than the trainee currently possesses. This "gap" must be corrected through training. The Job analysis provides with a comprehensive understanding of what is required to adequately perform the various tasks the job requires. Gap Analysis tells what the trainee, the farmer, is currently able to do. Find completed Gap Analysis Worksheet (Tasks) format on annex L.

Procedure for conducting Gap Analysis

The following steps provide a guide to applying Gap Analysis techniques to estimate the skill levels of trainees. The process is general in nature and should be adapted to your specific needs and situation. This technique should first be applied to proficiency analysis of tasks identified in the Task Breakdown Worksheets. This is done using a Gap Analysis Worksheet for "Tasks" (a blank form is given at the end of this section).

Step 1: List the 'tasks' that were identified on the Task Breakdown Worksheet on the Gap Analysis Worksheet. First list the task with the highest score determined during the Task Breakdown exercise. List the remaining tasks in descending order according to their score. This will focus analysis on the most critical tasks.

Step 2: Rate each task in terms of the trainees' current proficiency to complete it. This should be done on a scale of 1 to 5, with the following scale:

1 = cannot complete any part

2 = can complete less than half the task

3 = can complete more than half but less than the total

4 = can complete the entire task but takes too long

5 = can complete the task accurately and efficiently.

Step 3: Review the proficiency ratings and tick those tasks that appear to have low proficiency. Low proficiency means that there is a gap between what is desired and what the situation is currently.

Step 4: Decide if the "gap" can be decreased or removed through training. Not all deficiencies can be corrected by training. This step provides a check and balance against assuming that the training program can and should include every task that has the gap. For example, if a task requires that a complex chemical analysis be completed, it is very possible that training will not be effective. This task requires general ability in science, it requires sophisticated apparatus, and it requires controlled conditions. If these needs are not allowed, training will not be an appropriate solution for closing the proficiency gap.

Step 5: Discuss the results of the gap analysis and the proficiency ratings and the indication of gaps with one or more key people involved in the training activity. This might involve a Subject Matter Specialist who is involved in the training.

The following is an example of a completed Gap Analysis Worksheet (Tasks). Note that the time the tasks are listed according to the scores indicated in the Task Breakdown Worksheet example. The list begins with the task that showed the highest scoring and lists them in descending order.

Procedure for doing Gap Analysis (Actions)

You should complete Gap Analysis Worksheets (Actions) to help you determine proficiently rating you will give for each task in the Gap Analysis Worksheet (Tasks). Find sample Gap Analysis Worksheet (Actions) and Sample Gap Analysis sheet (Tasks) on Annex M & Annex N.

Step 1: List the 'actions' that were identified on the Actions Analysis Worksheet onto the Gap Analysis Worksheet (Actions). First list the actions with the highest score determined during the Action Analysis exercise. List the remaining actions in descending order according to their score.

Step 2: Rate each action in terms of the trainees' current proficiency to complete it. This should be done on a scale of 1 to 5, with the following scale:

1 = cannot complete any part

2 = can complete less than half the steps required

3 = can complete more than half but less than the total

4 = can complete the entire steps but takes too long

5 = can complete all the steps accurately and efficiently.

Step 3: Use this information to help in deciding on proficiency score for the

task in the Gap Analysis Worksheet (Tasks**).**Find sample gap analysis worksheet (Action) on annex O.

6.5. Effective Extension Training Needs Assessment

Several difficulties may hamper the successful formulation and implementation of irrigation extension training needs assessment in practice. While many problems arise out of the resource constraints faced by extension training programs (time and cost dimensions), many difficulties are of conceptual or institutional character e.g. poor understanding of what irrigation agricultural extension is or mixing of irrigation extension with rain fed agricultural extension. An awareness of these issues at an early stage will generally help the design of irrigation agriculture extension needs assessment exercises.

6.5.1. Understand farmers training Needs

One apparent difficulty with irrigation extension TNA is problem of needs 'perception'. To ease this difficulty, it is better to distinguish between felt and unfelt needs. The former is those needs with people do recognize, and the latter is those which they do not. With recognized needs, there is a robust spur or urge to take action to bridge "gaps". However, irrigation extension training needs assessment is more challenging when the knowledge and skill of such need among trainees is missing or unreliable.

Possible perceptions of Training Needs

Unfelt Need

Irrigation extension staffs' performance problem not perceived at all. Irrigation extension staffs' performance problem perceived, not aware that problem is due to lack of training

Felt Need - Performance problem perceived, aware of type of training needed, but unable to determine its amount Performance problem perceived, able to identify type and amount of training

6.5.2. Approaches of Training Needs Assessment

Needs assessment is concerned with identifying the type of training needed, as well as those in needs, down to the level of the individual, organization and its constituent elements (departments, units and individuals). There are three levels of need assessment approach.

- Organizational level need: Concerns identifying the type of training needed by organizations and /or units and departments within them.
- Occupational level needs: Involves identifying the attitudes and knowledge enhancements for carrying out a particular type of job or function
- Individual level needs: Deciding the organizational and occupational needs leads at the question of who or which individuals are in need of what type of training.

The difference between these should, however, not be inflated. There are clear intersections between these; nevertheless, each represents a particular angle or perspective from which identification of needs takes place.

There may be problems in the organization due to a lack of knowledge or skills. This may result in delays in completing work, results frequent errors, reports of dissatisfaction, unclear operational procedures or high absenteeism.

- Impending change such as new irrigation technologies, practices, processes and equipment may bring a need for capacity development through training
- There may be mandated training based on policies or management decisions that require implementation. For example, new irrigation extension full package, Gender, environment or nutrition issues

6.5.3. Techniques of Training Need Assessment

It is usually best to use multiple methods of training needs assessment to get a true picture of what is needed. There are several basic needs assessment techniques. Looking at the results of previous irrigation extension training need assessments, direct observation of extension staffs in the working environment,

questionnaires, consultation with persons in key positions and/or with specific knowledge, review of relevant literatures, interviews, focus group discussion, tests, records (employee files or personnel records; job descriptions) and report studies and work sample

6.5.4. Prioritizing Irrigation Development Extension Trainings Needs

Given the vast range of irrigation extension skills and other competencies, it is useful for irrigation extension experts to prioritize training and development, depending on the situation. Here are three other examples of methods for prioritizing training:

- **Essential/Desirable** - simply and quickly define each activity (skill, competency, whatever) according to whether it is essential or desirable for the irrigation extension job purpose and organizational performance. Training priority is obviously given to developing essential competencies.

- **Importance/Competency matrix** - the highest training priorities are obviously the activities (skills, competencies, whatever) which are high importance of task to organizational performance and low competence of trainee skill level.

- **Difficulty Importance and Frequency /DIF Analysis**: DIF Analysis is a sophisticated and potentially very complex method of assessing performance by prioritizing training needs and planning training, based on three perspectives: Difficulty, Importance, and Frequency. The system looks at tasks and activities (or skills, competencies) rather than looking at development from a personal individual perspective. DIF Analysis can be used in different ways: for example, as a flow diagram to consider each activity using a simple yes/no for each of the three factors in sequence of Difficulty (yes/no), Importance (yes/no) and Frequency (yes/no), which generates eight possible combinations. At a simple level, an activity that scores low on all three scales is obviously low priority; whereas an activity that scores high on all three scales is a high priority.

DIF Analysis does not automatically take account of personal preferences and potential capabilities, and as such, consideration to this aspect is wise where trainee commitment is influential upon development, which in most situations are the case.

- Other methods- exist for prioritizing training is to choose or develop a method, which is appropriate for your situation. Ultimately, the best way to priorities training can be simply to agree with the trainee what they are keenest to commit to.

  - Participatory Rural Appraisal (PRA) in Extension: PRA in extension is a technique by which several information including problems about farming community is collected. Some of the tools include interviewing key informants, reviewing secondary data sources, mapping exercises, and conducting semi-structured interviews with individual or group of farmers.

  - Development Agent Extension Diary: The DAs extension diary provides a means of identifying farmer problems and their information needs, and shows areas where training is required.

  - Knowledge, Attitude and Practice(KAP) Studies: Surveys of the knowledge, attitude and practice of farmers undertaking a particular task help to identify training needs. This is usually done by means of questionnaires with a range of questions to be asked.

  - Interviews with Farmer: Interviewing an individual or group of farmers help determine their training needs. Interviews have the merit of high farmer involvement and the capacity for training to be more directly aimed toward an individual.

  - Observations of Behaviour: IDAs / supervisors can make direct observation of farmer's behaviour. Weakness might be spotted during this process and suitable training is organized. For example, the farmer is not effective in talking to a group of farmers about a particular extension message that indicates a possible training need on the delivery of extension message.

  - Skills Tests: Proficiency test can be applied to manual skills and basic job knowledge. Skills testing permits elimination of meaningless repetition of training for skills previously acquired, whilst also revealing the scale of the remaining training task.

  - Policy Statements: Some training needs are identified by implementing policies being promoted. For example, the BoA or Woreda is promoting

environmentally sound extension messages and these needs to be reflected in the training programs.

Gender Box 6. Planning Extension Training and Identifying Training Needs

What are the issues of gender inequity in planning extension training and identifying training

needs?

Inadequate attention of gender issues during extension training planning. This is the stage where objectives of the training that incorporate a gender dimension and activities are defined Training needs assessment; Gap analysis and priority setting:-

Occasionally women especially women in MHH are not targeted for extension services such as; – training, input supply, post-harvest technology dissemination and markets.

Training time , places and delivery methods are often not convenient for women farmers (WMHH and FHH)

Weak consideration of labour and time saving women friendly technology promotion and dissemination

Few extension staffs are not adequately trained on gender issues and gender planning approaches

How can the gender issues be addressed?

At planning stage changes sought from the gender perspective including who, what, where, and when with resources should be defined

Translate the planned activities into action with the full participation of women, men and youth at all levels

Understand women's special needs, interests and constraints during extension training need assessment

Ensure women and men have equal access to information, training, technology and varieties of inputs

Extension services should target women farmers to ensure that they gain knowledge and implement appropriate agronomic practices

Target women farmers (30% targeting rate) for on farm demonstrations, agronomic advice and trainings.

Target women in male-headed households for agronomic practice and awareness raising trainings.

Prepare communications materials that are appropriate for women with low literacy levels and, taking into account their reproductive roles and safety concerns

Increase participation of women farmers by identifying appropriate time, place for training, and determine delivery methods.

Ensure women to participate in farmer institutions, access to market information and facilitate linkage

Ensure efficient research findings and dissemination system, which are open and equally accessible to women and men

Design appropriate training modalities that could enhance the level of awareness and skill of extension staff on gender issues and gender planning skills for more effective results on their respective responsibilities

What will be the benefits when gender issues are addressed?

Gender responsive planning extension training and identification of training needs will address the interests of both women and men farmers increase production and productivity.

CHAPTER- 7
ROLE & RESPONSIBILITY OF IDA'S

The functionaries of regional Bureaus and its experts are important for overall monitoring and supervision of progress of irrigation extension activities. The success of irrigation activities mainly at three levels (Region, Zone and Woreda) depend largely on the level of support and involvement of these experts in every sphere of irrigation development implementation. The key responsibilities of regional Bureaus are to:

- Develop various types of irrigated agriculture packages/manuals and utilize for irrigation extension services,
- Provide technical training regarding O&M of SSI, community water pond and MI schemes, irrigation agronomy, OFWM, NRM, management of IWUAs and conducting on-farm demonstrations,
- Provide technical support for construction/renovation of SSI, community water pond and MI schemes, dissemination of irrigation technologies and functioning of irrigation structures,
- Formulate guidelines/procedures regarding irrigation activities,
- Prepare training manuals and AWPs for using as a reference materials,
- Promote ICT and develop impact points on irrigation-extension,
- Enhance institutional arrangements, coordination and linkages,
- Facilitate market linkage and enhance value chains development,
- Enhance gender, youth, and nutrition mainstreaming

7.1. Duties & Responsiblity of Irrigation Development Agents (IDA)

An effective irrigation operating system help creates a strategic direction on streamlining and efficiently channeling irrigation extension services to the irrigation water users. Moreover, this is primarily achieved through the IDAs who have clearly defined sphere of operation as well as detailed work program.

Hence, the sphere of operation for operating irrigation extension service primarily depends on IDAs who can thrive and bring positive attitudinal changes among the irrigation water users community for increased irrigated crop production. According to BoA, each IDA's sphere of operational area, at Kebele scheme and community water pond level for operating irrigation extension services, is designated to focus more than 50 ha irrigated land within the kebele including modern and traditional irrigation schemes. In order to carry out day-to-day activities the following are the detailed work description (duties) proposed for IDAs:

- Undertake irrigation water users information needs assessment, and field surveys,
- Assist in the formation of IWUA and irrigation water user groups,
- Provide on-the-job training to irrigation water users in irrigation schemes,
- Assist irrigation WUG in the development of annual kebele irrigation extension planning,
- Advice irrigation water users, WUA and WUG on equitable water distribution,
- Advice irrigation water users on proper maintenance of irrigation infra-structures,
- Mobilize community and irrigation water users to develop Irrigation Agriculture Development (ADP) and Soil and Water Conservation Plan(SWCP)Act as a link between irrigation water users, ISC and support service agencies;
- Conduct irrigation demonstrations, field days, farmers rallies, experience sharing,
- Participate in monthly training at Woreda,
- Record daily events in the extension diary maintained by IDAs,
- Submit weekly and monthly progress reports to Woreda office.

7.1.1. Documentation of Basic Data and Familiarize with the Environoment

Prior to initiating duties in the scheme operational area, the IDA should be well acquainted with the sphere of his/her operations. Familiarization include understanding of main cropping patterns, distribution and size of land holdings,

soil types, topography, irrigation and drainage system, inputs dealers and other agricultural information which would be useful in performance of his/her duties. The IDA must also be familiar with the socio-economic conditions of his/her area, such as groups or factions, conflicts, competitions, influential persons in Kebele, as well as farmers' organizations such as WUA, irrigation cooperatives, multi-purpose cooperatives.

7.1.2. Work Schedule of IDA and its Content

The work schedule of IDAs comprises irrigation water user-visit schedule, training sessions and time allotted to other activities. The schedule covers a four-week cycle (28 calendar days) that farmers in every blocks are met on a fortnightly basis since job-embedded-support (JES) takes more time to address relevant subject matter such as crop water requirement, water distribution, water savings technology, institutional challenges, group work and other related extension activities. Sample IDAs' monthly work schedule for Irrigation Extension Service is showed in the table below.

Table- 9- Monthly IDA Work schedule for Irrigation Extension Service

Week – 1	Activity	Description
Day-1 Monday	Training at Woreda IADP	Attend monthly training on impact points/ irrigation extension messages at Woreda IADP office organized by IADP experts
Day-2 Tuesday	Support Services	Office work, liaise with the regular kebele DAs, make contact with institutional support services required for irrigation water users
Day-3 Wednesday	On-the-job training	Visit First 25% of irrigation command area (2 irrigation blocks), provide technical assistance and on-the-job training to WUG group leaders (contact farmers) and other irrigation water users
Day-4 Thursday	On-the-job training	Visit Second 25% of irrigation command area (2 irrigation blocks), provide technical assistance and on-the-job training to WUG group leaders (contact farmers) and other irrigation water users
Day-5 Friday	Visit other irrigation water users/cooperative	Visit to irrigation water users (non-contact farmers), hold discussions with them and irrigation cooperatives, provide solution to problems, etc.
Saturday and Sunday – public holidays		
Week – 2	Activity	Description
Day-6 Monday	Demonstration	Monitor the performance of irrigation demonstrations such as crop demonstrations, PTD, storage demonstrations, etc
Day-7 Tuesday	Support Services	Office work, liaise with the regular kebele DAs, make contact with institutional support services required for irrigation water users

Week – 1	Activity	Description
Day-8 Wednesday	On-the-job training	Visit Third 25% of irrigation command area (2 irrigation blocks), provide technical assistance and on-the-job training to WUG group leaders (contact farmers) and other irrigation water users
Day-9 Thursday	On-the-job training	In the afternoon, visit Fourth 25% of irrigation command area (2 irrigation blocks), provide technical assistance and on-the-job training to WUG group leaders (contact farmers) and other irrigation water users
Day-10 Friday	Visit other irrigation water users/cooperative	Visit to irrigation water users (non-contact farmers), hold discussions with them and irrigation cooperatives, provide solution to problems, etc.
Saturday and Sunday – public holidays		
Week – 3	Activity	Description
Day-11 Monday	Support Services	Office work, liaise with the regular kebele DAs, make contact with institutional support services required for irrigation water users
Day-12 Tuesday	On-the-job training	Visit First 25% of irrigation command area (2 irrigation blocks), provide technical assistance and on-the-job training to WUG group leaders (contact farmers) and other irrigation water users
Day-13 Wednesday	On-the-job training	Visit Second 25% of irrigation command area (2 irrigation blocks), provide technical assistance and on-the-job training to WUG group leaders (contact farmers) and other irrigation water users
Day-14 Thursday	Visit other irrigation water users/cooperative	Visit to irrigation water users (non-contact farmers), hold discussions with them and irrigation cooperatives, provide solution to problems, etc.
Day-15 Friday	Demonstration	Monitor the performance of irrigation demonstrations such as crop demonstrations, PTD, storage, demonstrations, etc
Saturday and Sunday – public holidays		
Week – 4	Activity	Description
Day-16 Monday	Support Services	Office work, liaise with the regular kebele DAs, make contact with institutional support services required for irrigation water users
Day-17 Tuesday	On-the-job training	Visit Third 25% of irrigation command area (2 irrigation blocks), provide technical assistance and on-the-job training to WUG group leaders (contact farmers) and other irrigation water users
Day-18 Wednesday	On-the-job training	In the afternoon, visit Fourth 25% of irrigation command area (2 irrigation blocks), provide technical assistance and on-the-job training to WUG group leaders (contact farmers) and other irrigation water users
Day-19 Thursday	Visit other irrigation water users/cooperative	Visit to irrigation water users (non-contact farmers), hold discussions with them and irrigation cooperatives, provide solution to problems, etc.
Day-20 Friday	Office work	Report writing, planning of irrigation water users training, data collection, or attend kebele meeting or participate in special extension event
Saturday and Sunday – public holidays		

In the event of missed day/s due to unavoidable circumstances, IDA can compensate the missed-day/s on Saturdays or Sundays. The IDAs have choice to alter the workdays according to the convenience of irrigation water users and kebele administration. The significant part of the work schedule of IDAs is that the target irrigation community is aware of IDAs' routine mobility and availability in the scheme/ community water pond or HHMI area, and their roles and responsibilities. Also, IDAs can use holidays (Saturdays and Sundays) to undertake activities with irrigation water users as and when deemed necessary to work on holidays (for example farmers have selected holidays for transplanting seedlings or irrigation scheduling as crucial time).

7.2 Arrange field visit and meetings

Schedule visits by IDAs in irrigation schemes are very important. The IDA visits to irrigation water users on a fixed day so that they know when IDA would be with them. In each visit, IDA spends the day with the IWUG leaders (Contact farmers), IWUA and makes efforts to meet other irrigation water users and does perform tasks. Throughout the irrigation season IDA will mainly put extension efforts on irrigation water management and facilitate services those required by irrigation water users. During visits, the IDA should:

- Check whether efforts have been made to adopt recommended new irrigation practices,
- Enquire about irrigation water user's problems, technical (e.g. seed-bed preparation, line sowing, weeding, water availability, pest control) and non-technical (e.g. availability of inputs, credit, farm produce prices, marketing),
- Note the condition of standing irrigated crops and any noticeable difference between crops to which recommended methods have been applied and those grown using traditional practices,
- Inspect equitable sharing of irrigation water,
- Inspect result demonstration plots

During field visits in the SSI, Community water pond or MI schemes, IDA communicates ideas and practices on extension messages (impact points) to IWUG leaders (contact farmers) those given during monthly training held at Woreda office. If the training topics concern improved irrigation-cultural practices, IDA should demonstrate these in the field using demonstration

materials and to make sure that irrigation water users understand them fully. While in the afternoon or evening, the IDA holds group meetings and discussion with the irrigation water users.

It is very important that IDA maintain a diary (irrigation-extension diary) to record his/her observations, unsettled questions, and problems that could be referred to other Woreda experts for clarification.

7.2.1. Conduct Irrigation water user Farmer Visits

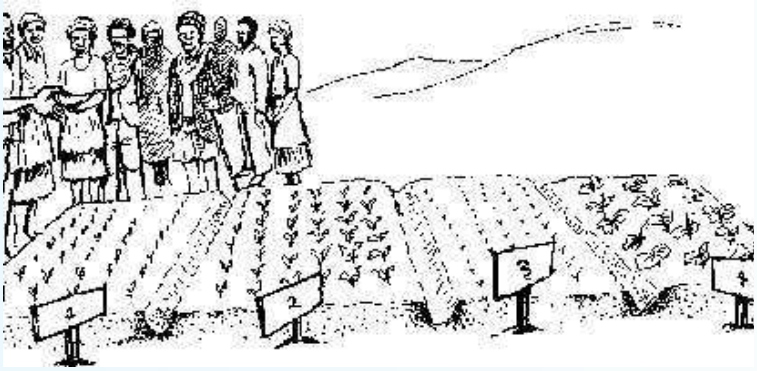
Irrigation water user farmer visits involve a group of irrigation water users visiting other farmers within the scheme (or further away) in order to share information about specific technologies or ideas. If done after a training course, the main aim of the visit may be to enable irrigation water users see the items taught during the course actually being used. The method is particularly useful to build farmers' confidence and to establish farmer networks. Farmer visits are often part of a broader irrigation extension program. They are useful in extension efforts such as on Group extension or as part of regular extension activities. The IDAs or IWUA generally organizes farmer visits in the schemes.

Advantages

- Farmers learn by seeing and doing. The farmers will see the technology being used, and may adopt it easily.
- Farmers tend to believe other farmers, so the spread of skills and ideas is much faster than through conventional extension.
- Seeing successful examples motivates visiting farmers to try to do better themselves.
- Visits help build relationships and networking among farmers.
- The visits build the confidence of the farmers hosting the demonstration.
- The farmers see and learn many things other than the specific technology they came to see.

7.2.2. Conduct Field Days

A field day is a group extension event conducted at the site of any type of method/result demonstration. Field days provide the opportunity for 20- 30 or more farmers to visit at demonstration site, learn about what is demonstrated, ask questions, and ask them to try new ideas themselves on their own farms.



Picture- 12:- participating farmers on irrigation development activities during field day incourage farmers.

7.2.3. Conduct Experience Sharing/ Motivational Tours

A motivated tour involves taking a group of up to 30 farmers from their irrigation scheme to another irrigation scheme area. Motivational tours expose farmers to developments or new technologies, which are being used by the farmers in another area, or are being developed by the research centers

7.2.4. Conduct Monthly Training at Woreda (key irrigation activities excuted and direction)

Training is as important as like other components of irrigation extension system. Training to IDAs help carry out work effectively by which extension messages can be timely communicated to the irrigation water users. Therefore, throughout the irrigation-cropping season, routine training given to IDA is very important. Training includes combination of lectures and classroom discussions, illustration with visual aids, and field practical. Give full one-day training to IDAs during each one-month cycle. The venue of the training is Woreda IADP training hall, and is offered by Woreda and zonal experts. Woreda takes the responsibility for organizing such monthly trainings.

The first part of the training focuses on lectures and discussions. Throughout the training, only 3 or 4 impact points (extension messages) or topics is covered. These can be for the same or different crops but must be applicable to irrigation water users' situation in irrigation water management during the next one month. Impact points should be taught thoroughly to IDAs. Use of catchwords and slogans can help with remembering impact points. After the lecture and discussion session, there should be a period for IDAs to practice giving irrigation

water user-level talks. This can be best done as a group activity with each IDA making a direct presentation on one impact point to the other IDAs adopting roles as irrigation water users. The one-day training on a one-month cycle prepares IDAs for delivery of impact points.

The second part of the training comprises fieldwork, either field visits to review the results of recommended practices or demonstration of the practices discussed earlier. After the fieldwork, training should end with a brief summary of each impact point and emphasis of the steps each IDA has to provide on-the-job training to irrigation water users. Each IDA gets a lesson sheet containing a summary of impact points for one-month cycle by which IDA can refer to the irrigation water users during field visits.

7.2.5. Key points & diection for Irrigation extension Selection

Impact points are carefully selected extension messages for increasing on-farm yields, irrigation water users' incomes and overall crop production. The messages are specific, simple in the beginning and covers different stages of irrigated agriculture. These are selected with a view to making the best use of easily available resources of irrigation water users. The respective Woreda IADP experts prepare the lesson sheet for impact points and these are imparted to IDAs during monthly training at Woreda IADP offices in the form, suitable for IDAs to use in irrigation extension services with the irrigation water users. The typical process by which impact points are developed comprises the following stages:

- Identification for the main cropping sequences for irrigated conditions,
- Emphasis is given on introducing hybrid/high-value vegetable, wheat and maize crops. The sequence defines the period occupied by each crop and the time-frame within which important cultural practices are carried out,
- Selection of impact points (usually limited to 3 or 4) for each irrigated crop in the selected sequences pertinent to irrigation block scheme (division of irrigation scheme),
- Preparation of a training program for irrigation water users and identification of training materials is provided for either training to irrigation water users in FTC settings or on-the-job training.

The impact points and corresponding training needs, requires finalization prior to the start of irrigation season to enable sufficient time for Woreda IADP experts (the trainers) to prepare details of IDA's monthly training program. An example of a lesson sheet and impact points is shown in Annex A.

7.3. Design a Training Event (Lesson Plans) for Irrigation water users

Training is an integral part of implementation of irrigation extension activities, and is important for a long-term development and sustainability of irrigation schemes. Training helps build capacity of irrigation water users to enhance adoption of improved irrigation technologies. Training of irrigation water users in appropriate practices related to improved water management is an essential ingredient in the improvements of rural livelihoods. With the assistance of Woreda experts, the IDAs will undertake various training programs for the target beneficiaries. The purpose of training on various aspects of irrigation production, demonstrations and extension are to:

- Assist irrigation water users to make good decisions, leading to optional use of their resources;
- ensure that irrigation water users are following the best farming practices;
- demonstrate to irrigation water users the application of appropriate techniques on irrigation that they are not familiar;
- acknowledge irrigation water users' local innovations and fit into extension events;
- train irrigation water users to use suitable irrigation equipment and inputs in relation to irrigation activities; and
- Train irrigation water users on environmentally sound techniques.

A good training program includes suitable lesson plans relating to particular training topic, designed to train the irrigation water users and contact farmers. Generally, a lesson plan is a description of a proposed training activity in the form of written, practical and demonstration in line with the irrigated crop production activities. Lesson plans is prepared using a standard format for all trainings whether they are in the classroom or on-the-job or demonstration. The preparation of lesson plans help ensure that training activities are purposeful and well organized. Without lesson plans, training can easily become irrelevant, incomplete and ineffective. The steps involved in preparing a lesson plan are as

follows:

- Establish a clear objectives for the lesson;
- Select the subject matter, which is required to achieve that objective;
- Structure the subject matter so that it is relevant, logical and educational;
- Selecting training methods, which are appropriate to for the achievement of the irrigation technique objective or the selected subject matter;
- Decide on what equipment/materials will be needed to carry out these subjects;
- Allocate the time required to carry out those methods.

The format of lesson plan makes easy for IDAs to conduct hands-on training for irrigation water users in either FTC or on-the-job settings based on the work plan or training needs assessment. Prior to planning a training, it is important for IDAs to conduct a training needs assessment to identify exactly what knowledge and skill is lacking with the irrigation water users (learner). Based on the lacking skill and knowledge of particular subject, the training lesson is designed. A training lesson format, shown below, is divided into a number of sections, which are as follows:

- Details of proposed training session at which the lesson will be presented (dates and location). If it is at FTC site or on-the-job irrigation, scheme site than mention FTC or scheme site. If it is in other place, like village or other centre, than mention that place;
- A learning objective (very important),
- Details of the requirements for carrying out the lesson/training program (time, visual aids and demonstration materials),
- An outline of the lesson (broken down into key technical information teaching and assessment methods and teaching aids),
- IT should seek opinion on lesson plan from Woreda experts before it is finalized. The experts should contribute on improvement of it.Annex B - A complete Training Lesson Plan (a Sample)

7.4. Conduct data Records and Internal Reporting

The IDAs are required to maintain records to enable them to perform their duties properly and to complete regular and periodic reports. Through proper record keeping, they can keep track of the progress of the irrigation extension

program with respect to crop growth, adoption of impact points by irrigation water users, feedback of irrigation water users, present and potential problems, etc. The record also facilitates statistical analysis and enables Woreda experts to get familiar with IDA's activities and progress. It is important to maintain two key records by IDA, which are a chart and an extension diary. The chart depicts IDA's visit schedule with corresponding dates. It helps IDA to keep record of accomplishment of planned and missed visits and ensures their attendance during the four-week cycle.

On the other hand, IDAs use the extension diary, which is the other important record, for keeping relevant background information on Contact farmers and other irrigation water users. It allows keeping basic information, making notes on crop conditions, and farmers' problem gathered from field visit.

The progress report is to be prepared on weekly and monthly basis by IDAs and submitted to Woreda office. General narrative guiding template in simpler form Annex C.

Gender Box 8. Role of IDAs, Selecting Impact Points, and Lesson Plans

What are the issues of gender inequity?

Women from FHHs and Wife in MHH may lack the required knowledge and skill to adopt improved irrigation practices hence, women sub-committees are not considered as important IWUA structure as they are supposed to be role model for women irrigation water users,

Recommended size of participant to plan field day and motivational tour is not disaggregated and women may lack attention, if women are not elected as WUG leader and women may lack technical assistance and on-the-job training

Impact pointes (extension messages) are not designed according to the literacy level and prior exposure of women farmers

Perhaps lack of accountability gender consideration is not stated on the roles of irrigation development agents

How can the gender issues be addressed?

The IDA and all responsible bodies have to ensure active involvement of IWUA women sub-committees as role model to encourage and to mobilize women irrigation water users,

Ensure the participation of women farmer (FHHs and Wife in MHH) in field day and motivational tour at all level from planning up to evaluation,

During training design IDAs need to consider not only suitable lesson plan but also suitable venue for female participants and should the training be pronounced ahead of time to achieve the desirable number of women participants during various training programs for the target beneficiaries

Ensure the inclusion of gender related statements on the roles of Irrigation Development Agents

What will be the benefits when gender issues are addressed

IDAs are accountable for the development of gender responsive lesson plan , convey gender sensitive extension messages and women sub-committees are considered as important IWUA structure and provided with all technical assistance and on-the-job training women from FHHs and WiM HHs are likely to adopt improved irrigation practices and technologies which eventually led to increase production and productivity

CHAPTER-8
INSTITUTIONAL SUPPORT, COORDINATION AND LINKAGES

The use of improved Agricultural technologies and practices is of paramount importance to improve the production and productivity of small farmers. This is particularly true where the traditional agricultural practices are dominating with low level of productivity and food insecurity situation particularly under rain fed condition. Therefore, the adoption of improved irrigation technologies is one of the agricultural extension approaches to achieve increased food production and to contribute to the efforts for poverty reduction. The adoption process of improved irrigation technologies requires active involvement of all actors involved in irrigation extension efforts. This includes researchers, input and credit suppliers, agricultural extension providers, NGOs, community and irrigation water users. Establishment of institutional support link is deemed important to bring all those actors to work together to address the needs of irrigation water users involved in irrigation and water harvesting. The major objective of the link is to address the felt needs of irrigation water users through strengthening the collaborative efforts of relevant institutions/stakeholders those involved in institutional support and irrigation efforts in general.

The new National Agricultural Extension Strategy of Government of Ethiopia, under Pillar7, emphasizes on enhancing institutional arrangement, coordination and linkages among key agricultural development partners. It is believe that such involvement of key stakeholders is important for promotion of improved irrigation technologies.

The role and contribution of existing Agricultural Development Partners' Linkage Advisory Council (ADPLAC) in the country, operating at all levels from Federal to Woreda levels in research-extension-farmer linkages is vital for effectivetechnology development and delivery to farmers, particularly in irrigated agriculture.

Considering the importance of research-extension-farmer linkage, the irrigation-extension experts and IDAs will need to offer their support to improve the awareness levels of stakeholders on the advantages of ADPLAC platforms and overall contribution to agricultural development in general, and in particular irrigated agriculture.

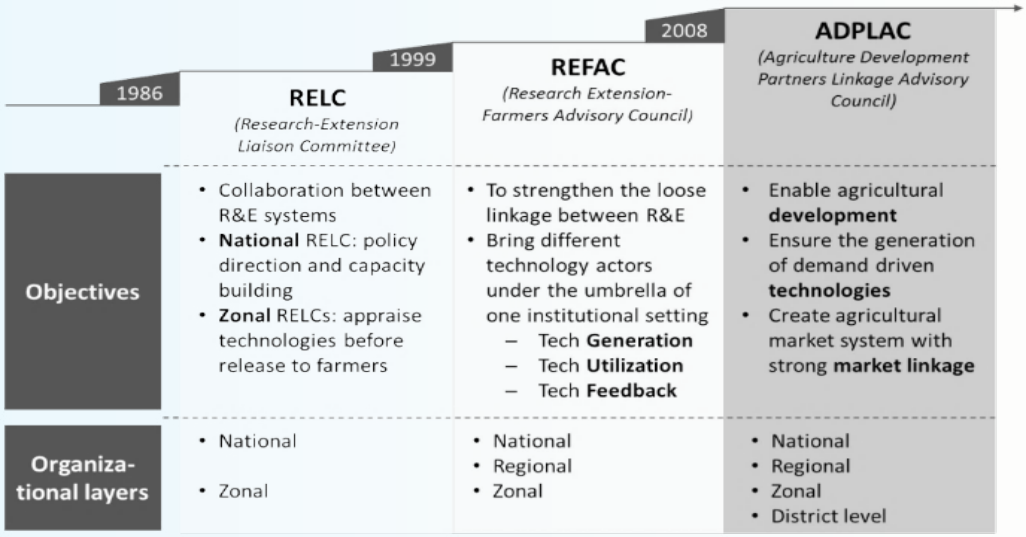


Figure- 6 - Capacity support for strengthening the linkages

Table- 10 - Capacity support for strengthening REF

Function	Capacity support strategy/action
Planning and review (Federal, regional, zone and woreda)	○ Organizing a irrigation planning workshop, Undertake joint review of irrigation plans Prepare joint irrigation extension plan Plan is endorsed by ADPLAC Prepare joint irrigation training plan and implementation of training Extension experts perform as master trainers to the training
Program formulation and priority setting	○ Program priority setting builds on the foundation created by situational analysis. It serves as a basis for making decisions on program priorities in irrigated agriculture Develop templates on situational analysis and priority setting techniques Examine the information through a series of filters to help determine program priorities Provide job-embedded support and training
Collaborative professional learning activities	○ Professional collaborative learning activities to enable knowledge gains and skills necessary to positively impact learning for skill transfer Staff can examine their work and improve practice Follow five strategies for collaborative professional activities, this include book studies, looking at expert's work, learning walks, lesson studies, and developing consistent expectations Evaluate the learning gains of clients

Exchange of resources to enhance capacity	○ Facilitating extensive discussions with partners for exchange of resources, which may include; Organize study trips (local and international) Accelerate skills development and capacity training Encourage Public-Private-Partnerships Strengthen local/community associations
Dissemination of knowledge and information	Supporting Partners on dissemination of knowledge and information related to irrigated agriculture in the form of: ○ Written material information instruments such as articles, newsletters, booklets, fact sheets, resource guides, editorials, press releases, news coverage, pocket cards, posters, research bulletins, science reports, etcElectronic material such as DVDs/ CD-ROMs, email alerts, Knowledge material available on the Internet, online registries of research evidence, real-time reminders, tailored messages sent by email, web conferences, and websites Interpersonal means of communication such as arts-based performances (i.e., theatre), a community of practice networks, forums, knowledge brokers, partnerships with stakeholders, and seminars/workshops
Co-ordination of professional activities	○ Developing coordination strategies for supporting the local professional organization including farmers'organization, Identify existing professional organizations (farmers' organizations, CBOs, agricultural associations, etc.)Support regional experts to form new professional organizations Support development of organization's TOR and constitution Support capacity training to professional organizations

In addition to ADPLAC platforms for links, different link strategies perhaps could be used to optimize the participation of relevant stakeholders/institutions at various levels of inputs supply, technology generation and transfer, market outlets and utilization process. This requires launching of an array of activities such as joint planning and review of irrigation extension programs, joint adaptive trials and demonstrations, field days, workshops, joint monitoring & evaluation under the auspices of BoA or Woreda.

In every aspect, a certain amount of its work capacity has link with other aspects in terms of support services and experiences of collaborative efforts. Therefore, irrigation extension has no exception since it has strong linkage of collaborative support service for successful implementation of planned irrigation extension activities with other stakeholders that correspond with the general goals and program concept of extension and irrigation management. The link that require support from other Processes/stakeholders are irrigation inputs supply, marketing, extension services, farmer associations, agricultural research

outputs, credit institution, irrigation cooperative, irrigation water users and soil conservation. Elements of the institutional support link with some names of the potential stakeholders are presented below:

Irrigation inputs supply is a backbone of irrigation efforts. This mainly involves Agricultural Input & Marketing Process at both regional, zone and Woreda levels. However, local vendors are also playing an imminent role for supplying of hybrid seeds, fertilizers, agro-chemicals and irrigation equipment such as sprinklers, water tanks, water lifting pumps, conveyance pipes, drip system, etc. The potential stakeholders are federal and regional Seed Enterprise, Agricultural, Inputs Supply Enterprise, Cooperatives and private individuals etc.

Output marketing principally involves Agricultural Inputs & Marketing Process of both Woreda, zone and at the Region. Its mandate is to conduct market intelligence and surveillance to forecast market demand of farm produces and prevailing commodity prices. In addition, it has role in creating marketing outputs and linking producers with the market authorities. However, other potential stakeholders are Cooperative Promotion Agency (CPA), private traders, storage provider etc.

Agricultural research output is primarily concerned for providing appropriate irrigated crop production technology packages to irrigation water users. The research centers have a mandate to work with extension service providers. In addition, the research goal is to evaluate the local suitability and the sustainability of irrigation production under present and changing climate conditions. Beside, some NGOs are conducting research activities.

Credit institution- including cooperatives and other private individuals helps provide credit facilities to the irrigation water users.

Irrigation cooperative depends on cooperation with IWUAs and irrigation block-WUTs. They are the guiding tools for contributing to successful management of irrigation water users Cooperative facilitates in inputs delivery, credit facilities, transportation of farm produces, linking markets and bridging the gap between irrigation water users and extension service providers. The cooperatives are also involved in both grain marketing chains and food security systems. The irrigation water users can utilize a good number of local storages at kebele.

Natural resources management attempts to bridge the empirical gap, using cost-benefit analysis to investigate the nature and severity of the soil degradation problem in irrigation schemes. It uses the techniques of soils conservation for crop retention. Thus, linkage with Woreda NRM Process is very important. The

role of Natural Resource Management Processin control of soil erosion and catchment development and maintenance is essential for smooth operation of MI schemes.

Irrigation WUA is the formal farmers' institution responsible for overall scheme, community water pond management and services to its beneficiary farmers. They play a critical role especially on mobilization of farmers for catchment protection, maintenance, local resources, planning and decision-making with various stakeholders and utilization of technology adoption for increased irrigated crop production.

Local Administration involves the regional, zonal, Woreda and kebele administrations. Their role in planning and decision-making, allocation of budgets and related issues to support the implementation and sustainability of institutional support linkages for irrigation development is a critical factor.

8.1. Objectives of Institutional Support & Linkage

It is recognized that each stakeholder has distinct responsibilities. The ultimate aim of launching effective institutional support link strategies is to manage the whole process and keep it rolling synergistically. The overall objective of link strategy is to establish an effective institutional support link mechanism and thereby enhance the rate of adoption of improved irrigation technologies. This could be achieved by employing more efficient linking strategies at various levels. The linkage strategy will bring all stakeholders together in the entire process of problem identification, prioritization, technology development, transfer and utilization together with inputs service delivery and feedback. The more specific objectives of institutional support link are to:

- Ensure that researchers and research programs generate problem solving and appropriate irrigation technologies by including irrigation water users' priority needs and constraints in their work plan or research agenda;
- Ensure timely testing/piloting, multiplication and dissemination of generated irrigation technologies;
- Ensure effective irrigation extension services for technology transfer and dissemination including training to irrigation -irrigation water users;

- Ensure timely provision of agricultural and irrigation inputs such as seeds, fertilizers, agrochemicals and farm implements including repair services, and create access to credit facilities for irrigation water users;

- Ensure that union/cooperatives offer services on organizational strengthening of in WUA, resolving water distribution conflicts and creating market opportunities;

- Ensure periodic services on operation & maintenance of irrigation schemes, community water pond, household micro irrigation in terms of canal maintenance, drainage, diversions, catchment protection and other regulatory tasks;

Update technological database regularly, formulating irrigation extension recommendations, and enhancing the transfer, adoption of technologies, and monitoring their impacts.

8.2. The Link Mechanism

The National Agricultural Extension Strategy of the government emphasizes on restructuring ADPLAC into thematic focused platforms and sub-platforms (paragraph 3.7.1a under key proposed strategic intervention). Following the government strategy on developing institutional linkage, it is proposed that a thematic sub-platform named, 'Irrigation Service Coordination (ISC)', to support the development of SSI and MI schemes be constituted within the framework of ADPLAC to operate under the overall guidance of BoA, as BoA chairs the ADPLAC.The approach in the development of link mechanism is environmental friendly, irrigation service-oriented and participatory. In this proposal, the link mechanismis addressed by establishing ISCsas sub-platformsat regional, zonal and woreda levels with specific terms of reference to promote improved irrigation technologies by conducting supervision, function and periodic meetings and workshops.

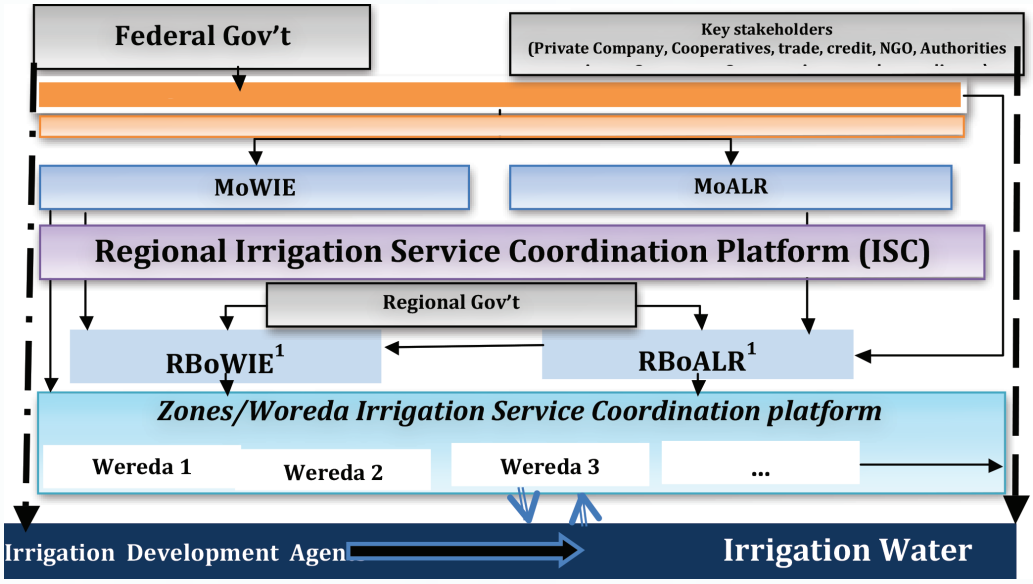


Figure- 7- Schematic Representation on Irrigation Service Coordination Platform

8.2.1. Linkage at Regional level

As a first step for link development, BoA will convene a first plenary meeting for the establishment of ISC sub-platform. The officials drawn from the key stakeholders/institutions be invited to participate in the plenary meeting to plan and discuss the usefulness of institutional support link for irrigation services. The members of ISC sub-platform be composed BoA's irrigation process, extension process, NRM department, Agricultural Input & Marketing Process (AIMP), Co-operative Promotion Agency (CPA), Regional research institute, and representatives of Ethiopian Seed Enterprise, Agricultural Input Supply Enterprise, Farmers' organization, and other relevant institution

Functions of Regional ISC

The major functions are to:

- Review the outcome or effectiveness of irrigation research and extension programs,

- Recommend and plan collaborative on-farm irrigation research programs using PTD approach and irrigation extension strategies for SSI and MI schemes.

- Review the consolidated annual irrigation-extension plan, its recommendations and accord approval for implementation.

- Review the demand of irrigation inputs such as seeds, fertilizers, pesticides based on annual irrigation extension plan, and develops a strategy of its availability.

- Review the accessibility of micro-credit for the irrigation water users, market opportunities of produces, and the availability of irrigation implements.

- Conduct joint evaluation, workshop and surveys in the region.

Periodic Workshop: The Regional ISC shall meet twice a year in the form of a regional workshop. The first workshop can take place prior to the irrigation-cropping season for reviewing irrigation research activities, availability of inputs and formulating irrigation extension recommendations. The Regional ISC workshop can take place immediately after the Zonal ISC workshop so that the workshop can discuss the outcome of Zonal ISC workshop and recommendations. The second workshop be held at the end of the irrigation-cropping season to evaluate the executed institutional support irrigation extension programs in the region and other emerging issues and shortcomings, and again the regional workshop can take place after the Zonal ISC workshop. The Regional ISC will invite workshop discussion papers from the participants including Zonal ISC for enriching workshop agenda that will turn into actionable plans.

Irrigation water user Association (IWUA), community water pond and invited HHMI farmers' participation in the workshop is a centerpiece of the workshop. The workshop will take the form of farmer led discussions whereby irrigation water users are given the chance of forwarding feedback on irrigation technologies, extension activities, inputs supply and emerging issues that are of concern among the SSI, community water pond and household MI communities.

The number of workshop participant should be sizable for detail discussion and hot participation. Women remains a key issue in any irrigation extension related forums.

8.2.2. Linkage at Zonal level

The rationale of formulating Zonal ISCsub-platform is identical to Regional ISC having similar objectives. The Zonal ISC will have a chairperson and a member-secretary. The Zonal ISC will be responsible for the overall guidance of irrigation extension programs, research, inputs supply and marketing, and link management at zonal level. It will be responsible to oversee link activities undertaken by the respective stakeholders/ institutions at zonal level.

The composition of Zonal ISC has to comprise of Zonal BoA, departments of Farm Division, Extension Process, Irrigation Development & Design Process, Agricultural Input & Marketing Process, Co-operative Promotion Agency, NRM Process, Zonal Research station, representatives of Ethiopian Seed Enterprise, Agricultural Input Supply Enterprise, farmers association/organization and other relevant institution

Functions of Zonal ISC

The major functions are to:

- Review, prioritize and approve irrigation extension, research, inputs delivery problems as identified by the relevant agencies and irrigation water users during irrigation-research review meetings.

- Review the performance of the adoption of irrigation technologies, and extension programs in the zone as related to local irrigation production constraints/potentials.

- Review Woreda draft annual irrigation extension plan, make necessary comments and transmit the draft to regional ISC for approval.

- Recommend and plan collaborative programs for joint Zonal BoA and Agricultural Research centres for undertaking on-farm level investigations aimed at improving the efficiency of irrigated crop production systems and irrigation water user's resource management within the SSI and MI schemes.

- Review the demand of irrigation inputs such as seeds, fertilizers, pesticides based on annual irrigation-extension plan, and develops a strategy of its availability.

- Review the accessibility of micro-credit for irrigation water users, market opportunities of produces, and the availability of irrigation implements.
- Assist in strengthening the organizational development of IWUA.
- Undertake field visits to assess the performance of irrigation-research, irrigation-extension service, and IWUA and cooperatives activities.
- Conduct joint evaluation, workshop and surveys in the region.
- Submit annual progress reports to Regional ISC.

Periodic Workshop: The Zonal ISC shall meet twice a year in the form of zonal workshop. Hold the first workshop prior to the irrigation-cropping season for reviewing regional irrigation-research activities, inputs availability and formulating irrigation-extension recommendations. The second workshop can held at the end of the irrigation-cropping season to evaluate the executed institutional support irrigation-extension programs in the region and other emerging issues and shortcomings. The Zonal ISC will invite workshop discussion papers from the participants for enriching workshop agenda that will turn round into actionable plans.

Participation of two key officials from pilot Woredas (Head, Woreda office of Agriculture and Irrigation Process Leader) in the workshop is crucial to get a feedback on irrigation technologies, extension activities, inputs supply along with the element of annual irrigation-extension planning of the respective Woredas and the anticipated institutional support. Likewise, farmers' participation in the workshop is important to enable the form of farmer led discussions whereby the irrigation water users will have chance of forwarding feedback on irrigation technologies, extension activities, inputs supply and emerging issues that are of concern among SSI and MI irrigation communities. It is preferable to have more participant farmers including female farmers those involved in SSI and MI activities.

It is recommended that number of participants in zonal workshops may not exceed more than thirty numbers. This will help the organizing committee to facilitate the workshop for smooth handling of technical sessions and group discussions.

8.2.3. Llinkage at Woreda level

Following the similar process of regional and zonal ISC sub-platforms, the pilot woredas will take initiative of forming Woreda ISC sub-platform under Woreda ADPLAC platform. The Woreda Office of Agriculture is mainly responsible for overall guidance and management of Woreda ISC. The Woreda ISC oversees extension programs, research, irrigation development, NRM, inputs supply and marketing, and link management. Any issue that needs attention of higher authority, the Woreda ISC may forward to respective authority for major decision.

Periodic meeting and workshop: Generally, Woreda ISC meets as and when necessary depending on the nature of work demand. There is no formal timeline for Woreda ISC to hold a coordination meeting. However, considering the importance of SSI and MI development, it is suggested that Woreda ISC meet at least three times during irrigation season. The frequency of Woreda ISC meeting can be enhanced depending on the need and urgency of irrigation efforts. As per work agenda of Woreda Irrigation office, the Woreda Irrigation-Extension Process will initiate discussion relating to irrigation planning, implementation, monitoring and procedure for irrigation workshop. It is recommended that prior to irrigation season a workshop be organized to consolidate and formalize Woreda level irrigation plan with the participation of relevant stakeholders such as research centers, inputs suppliers, local cooperatives, credit institutions, NRM, IWUA, irrigation water users irrigation water user of SSI and MI schemes etc. The workshop will facilitate linkage among the key stakeholders for accessing inputs and support services including irrigation agronomy priorities. It will also induce a sense of commitment of the participating stakeholders for ensuring smooth irrigation extension services. Finally, the workshop will consolidate the kebele level irrigation plan into Woreda irrigation plan, and forward the plan to Zonal ISC for approval.

8.3. Functional Framework of Irrigation Service Coordination (ISC) Sub-Platform

The functional framework of ISC underlines the field level link and coordination, where extension workers, researchers, cooperative workers and irrigation water users assemble in the field. It refers to day-to-day activities that operationally link field level practitioners through coordinated efforts.

Table- 11- Functional Framework of ISC Sub-Platform

Description	Institutional Support Activity	Institutional Support Link Mechanism	Responsible Institution
Irrigation Technology Development	Irrigation research agenda setting	Joint problem identification and prioritization, joint review meeting	Research Centers
	Awareness creation on identified SSI, community water pond and MI technologies	Community mobilization, farm-media broadcasting, posters & pamphlets, demonstrations, fairs, workshops	BoA and ARARI
	Technology verification	Joint adaptation using PTD trials and demonstrations	Research, BoA, Private sector, IWUA, HHMI and community water pond users, IDAs and other relevant partners
Technology Multiplication	Technology multiplication	Provision of breeder, foundation seeds, irrigation prototypes to seed/ prototype multiplication centers, other authorized agencies delegated by regional or federal government.	Research Centers and other authorized
	Demand creation and feedback	Joint irrigation water users technology need assessment	Zonal BoA and Research station
Technology Dissemination	Formulation of irrigation extension recommendation, follow-up, evaluation	Joint formulation of irrigation extension recommendation, training, follow-up and evaluation	Regional, zone Woreda ISC, office Agriculture, Research Centers, community representatives
Irrigation Inputs	Irrigation water users demand of irrigation inputs	Provision of hybrid seeds, fertilizers, pesticides, credits, farm equipment, agrochemicals etc.	ESE, AISE, unions/ Cooperative or any authorized institution
Credit Facility	Credit need for irrigation water users of SSI, community water pond and MI schemes	Provision of credit in the area of irrigation operation	Cooperatives, rural banks

Description	Institutional Support Activity	Institutional Support Link Mechanism	Responsible Institution
Irrigation water user Association	Organizational development	Joint strategies for developing or strengthening of IWUA and IWUT	BoA and allied institutions
	Irrigation water management	Equal distribution of water, scheduling, water savings, by laws	BoA and allied institutions
	Market opportunities	Creation of market outlets	BoA and allied institutions
Operation & Maintenance	Periodic services needed for SSI, community water pond and HHMI irrigation water users	Provision of services on maintenance of canals, drainage, HHMI& community water pond other regulatory tasks	Woreda,& zone BoA/ Irrigation Office, all level of ISC sub-platforms
Monitoring & Evaluation	Monitoring and evaluation	Joint monitoring, evaluation and learning, feedback & progress reports	All level of ISC sub-platforms
Irrigation Workshops	Holding workshops at regional, zonal and Woreda level	Review zonal irrigation plans, ensure inputs support, formulate irrigation extension recommendations	Regional ISC, BoA BoWRD, Research Institutes, CPA

8.4. Proposed Key Roles of Relevant Irrigation Development support stakeholders

The following section suggests the roles and responsibilities of the complementary Processes in supporting the SSI, community water pond and MI activities in the region.

8.4.1. Irrigation Agriculture-Extension Directorate

- IAEPto collect information on community needs and irrigation technology gaps and forwards its findings to ISC to help prepare irrigation technology packages.
- Respective BoAs to ensure presence of IDAs during the irrigation

season to assist irrigation water users of SSI, community water pond and MI schemes.

- IAEP to assist in the preparation of training curriculum on irrigation aspects, setting on-farm irrigation and FTC demonstrations SSI, community water pond and MI schemes such as crop demonstrations, PTD events, water lifting devices &pumps, drip system, etc.

- IDAs and Irrigation extension experts IAEP facilitator monthly training to support in evolving irrigation impact points (extension messages)

- Adapting designed extension system in accordance with the regional existing situation, and follows its implementation within the regional level and undertakes and review whenever it is necessary.

- Collecting improved technologies and best practices to prepare and introduce different extension packages to Zonal & Woreda and follow up its implementation.

- Conduct needs assessment to identify farmers' problems and priorities within the region to provide the feedback to ADPLAC and other institutions.

- Produce different extension messages to provide necessary and timely information to irrigation farmers.

- Provide necessary training, workshops, and experience sharing to improve the capacity of Zonal and Woreda staff.

- Study problems related to the implementation of irrigation agriculture extension system, provide alternative solutions, and monitor its implementation.

- Evaluate the performance of the annual irrigation agriculture extension program implemented within the region, organize workshop, and provide feedback to Zone& Woredas for effective planning of next AWP.

- Continuous follow up and supervision of practical implementation of

the extension activities at the field level to provide on job technical assistance to Zone and Woredas technical staff to improve their capacity.

- Identify successful FTCs within the region, collect and compile their good experience of MI demonstrations to scale up to other FTCs.
- Coordinate the implementation of activities related to Regional ADPLAC.
- Establish and support Regional level SMS Technical Team,
- Follow up the implementation of different projects within the Extension Process Owner by assigning dedicated focal persons,
- In close consultation with the Federal MoALR adopt the produced materials and guidelines related to the irrigation-extension system to regional existing condition and following up its implementation.
- Conduct review meeting with the Regional SMSs to evaluate the success of the irrigation-extension service.

8.4.2. Irrigation Development Inputs Supply & Marketing Proces

Agricultural inputs and marketing plays a pivotal role in all stages of irrigation production and development of irrigation water users. Irrigation Agriculture inputs and marketing consideration starts even before the production decision and sustainability of the production technologies are determined, among others by the marketing factor. Therefore, the role of inputs and marketing to increase and sustain irrigated crop production is important. To this effect, its role would be:

- Collect and compile annual irrigation inputs demand collected by Woreda offices, and ensure the supply chains distribute those to the farmers who are need of inputs.
- Facilitate IDAs irrigation experts' access to inputs dealers/suppliers and credit institutions for the availability of farm credits, agricultural inputs, irrigation equipment and its spare parts for the irrigation

water users. In this way, the IWU will be able to establish link with these stakeholders.

- Conduct market intelligence for collection of market information and movement of farm products and compile, analyse and transmit this information to producers and IWU.

- Facilitate the irrigation water users in linking with food processors and food industries about value-addition and marketing of irrigated farm products;

- Collaborate with relevant stakeholders to provide training to IDAs, Irrigation experts, IWUAs and women farmers on quality of irrigated products and marketing.

8.4.3. Natural Resource Management Department (NRMD)

- Assist in community mobilization for catchment development and treatments of the irrigation schemes, Ponds, dams, and reservoirs;

- Assist and train IDAs to undertake physical and biological soil and water conservation, and nursery activities for watershed development in the SSI and MI schemes.

8.4.4. Irrigation development Cooperative Promotion Process (IDCPP)

- Provide training and support to strengthen IWU and cooperatives such as establishing of a proper 'book-keeping and record handling system'.
- Coordinate and support provision of irrigation inputs and credit to irrigation water users associations through irrigation cooperatives or multi-purpose cooperatives.

8.4.5. Agricultural Research Institutes

A close relation among development partners is crucial for a successful delivery of agricultural technologies to the society. It is thus vital to strengthen relations

between research and extension at all levels. It is necessary to ensure that farmers' problems are properly identified and passed on to researchers on one hand and the discovered solutions are properly delivered to farmers on the other hand through a strong and reliable system of relation among agriculture and rural development bodies.

It is necessary to create a coordinated system of working relation among agricultural research centers, agricultural extension bodies and other stakeholders both at federal and regional level. The current ADPLAC platform include research institutes of all levels, agricultural extension implementing bodies, higher learning and research institutions, inputs and credit organizations and users of the service. Therefore, the role of ISC sub-platform is to ensure constant coordination with these institutions

8.4.6. Role of Partner Organizations

Creating a coordinated working system between all levels of agriculture offices, and other governmental / non-governmental organization and private sectors engaged directly or indirectly in promoting small-scale and micro irrigation technologies can play a great role for the success of the development of SSI and MI schemes. This coordination among all levels of agricultural extension service providers (government, non-governmental organizations, private sectors, input suppliers, traders, cooperative unions, etc) helps to identify farmers' problems, to jointly find and implement solutions and achieve fast and sustainable rural development.

Therefore, it is necessary to undertake joint planning, implementation and evaluation activities by creating a strong relation as well as considering the following:

- High level motivation and commitment in irrigated agriculture,
- Active participation in ISC sub-platforms,
- Continuous follow-up to ensure their contributions,
- Recognizing private sector and NGOs contribution on the ISC's meeting,
- Monitoring and close follow-up of decisions made by ISC, and
- Regular communication between concerned bodies

Gender Box 8. **Institutional Support, Coordination and Linkages**

Gender Box 8. Institutional Support, Coordination and Linkages

What are the issues of gender inequity?

In the ADPLAC / Research Extension Farmers linkage, women organizations are not represented and members lack the required knowledge and skill on gender mainstreaming in irrigation agriculture and development of gender responsive extension systems. Gender commonly not be included in their agendas for discussion and consideration.

Identification of development of needs and technology gaps and prioritizations often generalized to all farmers without or limited consideration of men and women, i.e. female-headed household and women in male-headed household.

During farmers' representation in linkages forum, women and men farmers not equally represented.

When situation analysis undertaken to make decisions on program priorities, gender issues are overlooked or all male and female farmers are consider as one.

Training manuals and FTC curriculums not designed/developed by taking female farmers literacy level, language preference and level of understanding in to consideration.

As men and women have different needs and priorities, the impact of any extension technology/ approach might have a different impact on men and women farmers. However, when evaluation of successes and failures of the implementation of extension systems/approaches are undertaken, all farmers taken as uniform and the findings might not disaggregated for women and men.

How can the gender issues be addressed?

In order to mainstream gender in irrigation agriculture and develop gender responsive extension approaches the plat form/linkage women organization and gender experts need to be invited.

Ensure the inclusion of gender issues in ADPLAC's/Research Extension and Farmers linkage meeting agendas to meet the intended objectives.

During identification of development needs and technology gaps and prioritization the status of men and women farmer, FHH and WiMHH, with respect to resource availability, household level decision making, control over resources and exposure to different extension services has to be considered. Therefore, when situation analysis are undertaken it is must to include gender analysis which is a way to look at a society in its totality to ensure that the interests of all its members—men, women, and youth are equally and equitably addressed.

In the ADPLAC's meeting women and men, farmers have to be equality represented, which will help to see issues from their practical point of view.

During the development of training manuals and FTC curriculum, take in to consideration women's literacy level, language preference and level of understanding. In most cases, they are illiterates and they prefer their local language and practical level trainings.

Pay attention to promote innovation of women friendly technologies for irrigation water management

Include gender specific indicators in ADPLAC guideline and other linkage strategies to monitor and evaluate the extension systems successes and failures in relation to women participation in extension services and performance of extension services for men and women, FHH and WiMHH.

What will be the benefits when gender issues are addressed?

ADPLAC and other platforms/linkages are a potential opportunities to promote gender responsive extension services including means of enhancing women participation. If linkages and platforms work in a gender responsive manner, the designed extension services will address all needs and priorities of women and men farmers. Services and development approaches designed based on the needs and preferences of men and women farmers will stay sustainable and bring a required impact. This will increase agricultural productivity and ensure that women and men farmers will have equal access to resources, goods and services and decision-making in rural areas and improve living conditions of men and women farmers'.

CHAPTER-9

PROCESS OF PLANNING FOR IRRIGATION DEVELOPMENT EXTENSION ACTIVITIES

Planning of irrigation extension should be participatory and done bottom up(i.e. should start from kebele) with the involvement of relevant stakeholders importantly participation of irrigation water users is an integral part of irrigation extension approach that help to lead sustainability of irrigation schemes. Success of household micro irrigation, community pond, and schemes depends on how the planned activities were timely implemented by following irrigation extension planning steps.

Each year, irrigation extension should identify irrigation water user needs, and prepare an irrigation extension plan to undertaking irrigation activities. Generally, the annual irrigation extension plan among others includes activities such as, identifying water source & land, identify and numerate household irrigation users, farm lay-outing, review/or formation of IWUA, selection of crop cultivars and livestock, identification, documenting good/best practices, O&M strategies, market outlets, procurement of inputs, field days and training. During the irrigation season, the IDA and irrigation expert will work closely with the beneficiary-irrigation water users and assist the IWUA in implementing planned activities from the annual irrigation extension plan. In many cases, implementing these activities will lead to new ideas for irrigation extension events, and for follow-up work, which was not in the annual irrigation extension plan.

As a bottom-up planning, it requires to prepare an annual irrigation extension plan prior to the start of irrigation season, starting from irrigation scheme block level with involvement of IWUA, HHMI user and community water pond at FTC or during community mobilization time. Based on the bottom up planning of woreda, zone and region will facilitate the input provision and distribution, provide technical support, identify good (best) practices monitor and collect feedback.Here, IDA and irrigation experts acts as a facilitator and provides planning skills to IWUA. After consolidation of all the draft irrigation-block plans of a given irrigation scheme by the executive committee of IWUA, the consolidated plan is forwarded to respective kebele administration for review.

Finally, the approved kebele-irrigation plan is send to Woreda office for further review and planning. While developing an initial annual irrigation plan at all levels the following needs to be taken into consideration:

- Identification of traditional and modern irrigation schemes, household micro irrigation, community water pond etc;
- Identification of relevant stakeholders such as cooperatives, agro chemical and other inputs dealers, irrigation technology suppliers, credit agency, irrigation equipment suppliers, market outlets and listing of irrigation water users;
- Assessment for construction, if required, or rehabilitation of minor irrigation units such as diversions, dams, boreholes, pumps, nursery bases, etc;
- Improvement of field canals and on-farm works;
- Preparation of cultivable land in irrigation schemes;
- Development of river diversion schemes using gravity or pump supply for small scale irrigation schemes;
- Development of and training of irrigation water user committees ,contact farmers irrigation experts and IDAs in water management;
- Participation of cooperatives and inputs dealers for supply of fertilizers, pesticides, seeds and irrigation equipment etc;
- Plan and establishment of irrigated demonstrations;
- Promotion of extension community mobilization led by IWUA such as field days, experience sharing, field trip, on improved irrigation cultivation techniques, adoption of irrigation technologies, household micro irrigation, community water pond management , scheme management, good/best practices , compost preparation using local technologies etc;
- Introduction and promotion of irrigated high-value crops and effect value chain ;
- Promotion of post-harvest technologies and value addition of produce for markets;
- Development of market information system for irrigation water users;
- Kebele level discussion with IWUAs, household micro irrigation and community water pond users ;
- Development of improved crop production technology packages;

- Using cropping calendar for inputs required and mechanism of supplies;
- Matching irrigation water demands and supply;
- Irrigation scheduling of water distribution;
- Conflict management

Table- 12- A general Annual Irrigation Extension Planning steps

Steps	Task	Description of tasks	Responsibility
1	Irrigation irrigation water user Needs/ Gap Assessment	Identifying irrigation water users needs/ gap, using problem census, PRA, meetings and IDA extension diary through working with male and female irrigation water users	IDAs & irrigation experts
2	Irrigation Scheme-Block Irrigation water user Group (IWUG) for irrigation planning	Working with IWUG and group leaders for preparation of draft irrigation-block plans. All plans are reviewed and consolidated by respective WUA, and is forwarded to Woreda after being reviewed and agreed by the respective kebele administration	IDAs, irrigation expert, IWUAs and Kebele administration
3	All level Irrigation sub plat forum/ irrigation service Committee (	Sharing information about irrigation water users' needs, available resources and ideas for collaboration and agreement among Woreda and discussion about organizing Woreda irrigation planning, monitoring and evaluation	All level irrigation sub plat forum
4	Compilation of information for irrigation extension planning	Compiling background information, monitoring and evaluation data, results of surveys, evaluation and Irrigation water user Information Need Assessment/ WUINA. at all level planning	At all level irrigation
5	Development of Irrigation Planning	Developing a draft irrigation extension plan on the basis of draft kebele irrigation planning information	At all level
6	Finalization of irrigation plan and budgeting	Finalizing the results of the draft Irrigation Planning and preparing budget documents at level. IDAs, irrigation experts, extension agencies and other concerned stakeholders.	at all level
7	Zonal Institutional Support Coordination (ISC)	Reviewing of Woreda irrigation extension plans, and providing extension recommendations	Zone
8	Consolidation of annual zonal irrigation extension plan	Consolidating Woreda irrigation extension plans with comments, and forwarding them to regional level IADP office for approval	Zone

Steps	Task	Description of tasks	Responsibility
9	Technical review of irrigation extension plans	Conducting a technical review of consolidated irrigation extension plans in a workshop participated by BoA's Processes, RARI, BoWRD, CPA, irrigation water users, and support service stakeholders	Region
10	Approval of Irrigation Extension Plans	Approving consolidated Zonal irrigation plans (includes Woreda plans) and sending back to Zone for onward transmission to Woreda	BoA
11	TOT irrigation and technical training	TOT Training provided to Zones and Woreda experts on irrigation extension, irrigation agronomy and irrigation engineering aspects	BoA
12	Training to IDAs on extension and technical aspects	Training given to IDAs by Woreda experts (TOT Trainees) prior to commencing irrigation activities	Woreda& Zone
13	Implementation strategy and monitoring	Implementing irrigation extension activities as planned, monitoring and supervision	Woreda&zone
14	Evaluation of irrigation extension program	Evaluating irrigation extension programs using knowledge, attitude and practice surveys	Woreda and Zone& Region
15	Preparation of progress reports of irrigation extension programs	Preparing monthly progress reports and a brief annual progress report of the outcome of irrigation extension activities	Kebele, woreda, zoneand region

Table- 13 - An Irrigation Extension Plan (Sample format)

TASK	ACTIVITY	Responsibility	J	F	M	A	M	J	J	A	S	O	N	D
1.Irrigation water user Needs/gaps Assessment (WUINA)	▯ Conduct problem census, PRA ▯ IDA records farmers problems in extension Diary on a regularly basis	IDA and Irrigation experts												
2.Irrigation Scheme-Block irrigation water user group (IWUG) for irrigation planning	▯ Organize IWUG members and team leaders ▯ IWUT prepares a draft irrigation block plan ▯ IWUA consolidates all the block plans ▯ Kebele administration review the plans and transmits to Woreda ISC for approval	IDA and IWUT, IWUA, irrigation experts												
3.Irrigation service committee	▯ Develop a meeting agenda ▯ Review WUINA results and performance of extension programs ▯ Invite other key Woreda offices ▯ Arrange visual aids and presentations	Woreda IMC												

TASK	ACTIVITY	Responsibility	J	F	M	A	M	J	J	A	S	O	N	D
4. Compilation of information for irrigation extension planning	Compile the findings, Need assessment results and discussion held in planning meeting Compile monitoring and evaluation data	Woreda												
5. Development of Woreda Irrigation Plan	Prepare a draft irrigation extension plan Circulate draft to members for comments	Woreda												
6. Finalization of Woreda irrigation plan and budgeting	Finalize the draft irrigation plan Prepare a budgetary document for the plan Submit draft plan to Zone for review	Woreda												
7. Zonal Institutional Support Coordination (ISC) sub-platform	Develop TOR of the ISC Enroll relevant stakeholders for membership in zonal ISC Review draft Woreda irrigation plan	Zone												
8. Formulation of annual zonal irrigation extension plan	Consolidate all Woreda irrigation extension plans with recommendations Submit consolidated plan to region	Zone												

TASK	ACTIVITY	Responsibility	J	F	M	A	M	J	J	A	S	O	N	D
9. Review and approval of irrigation extension plans by Region	● Develop TOR for region coordination ● Enroll members from bureaus, research, inputs dealer and other stakeholders ● Organize technical review of plan & budget ● Improve consolidated plan with comments ● Approve draft plan and budget and send the plan to Zone for final version	Region												
10. Adjustment of Consolidated Irrigation Extension Plans	● Based on the comments from regional Coordination Committee, necessary adjustments to each Woreda irrigation plan is made; ● Final version of plan is sent to Woredas for implementation	Zone												
11. Irrigation extension & technical trainings (agronomy, engineering aspects)	● Develop a 2-week TOT training plan on “Participatory irrigation extension” ● Develop a 2-week TOT training plan on irrigation agronomy and engineering aspect ● Provide TOT training to Woreda experts	Regionl Zonal Irrigation office												

TASK	ACTIVITY	Responsibility	J	F	M	A	M	J	J	A	S	O	N	D
12. Training on irrigation extension and technical aspects	● TOT trainees (Woreda experts) provides similar training to IDAs ● IDAs provide on-farm training to irrigation group leaders and irrigation water users	Woreda												
13. Implementation strategy and monitoring	● Identify suitable irrigation scheme ● Deploy IDAs taking responsibility of schemes ● IDA assist in formation of IWUA and IWUG ● Make contacts with relevant stakeholders ● IDA provides trainings to WUG leaders ● Draw a farm-layout and irrigation schedule ● Collect inputs and improved seeds ● Organize demonstration and field days ● Continue monitoring and maintain linkages	IDAs and Woreda experts												
14. Evaluation of irrigation extension programs	● Conduct baseline and monitoring surveys ● Conduct evaluation using crop cuttings and other surveys	IDA and experts												

TASK	ACTIVITY	Responsibility	J	F	M	A	M	J	J	A	S	O	N	D
15. Preparing budgets and submit progress reports	● Prepare and submit monthly and annual progress report to Woreda ● Prepare budget for next year intervention	IDA and experts												

Irrigation water userNeeds Assessment (WUINA)

- Throughout the year, IDAs and irrigation experts conduct PRA, problem census, meetings and discussions with irrigation water users, and record the problems, opportunities, threats and possible solutions/ recommendation(e.g. the extension diary),

- Irrigation water user Need Assessment) WUNA results helps in the annual planning review process.

Irrigation Block water users Group (IWUG)

- IDA organizes IWUG planning meeting in FTC or in irrigation scheme,
- WUG leader/committee assist the block members in the preparation Agricultural Development plan / block plan
- Blocks plans are consolidated by the respective IWUA,
- Kebele administration review the plan and submits to Woreda irrigation office,
- A descriptive version of irrigation planning document details out implementation strategies of major activities that are carried out,
- The plan is submitted to Zone for review and approval

Table- 14 - Annual Kebele Irrigation Planning Activity Form (Sample)

#	Activity	Unit	Annual Target	Budget	Responsible	Timeline
1	Maintenance - Cleaning canals - Removal of silts - pump house - etc.	No. of labors (man days)				
2	Mobilization of watershed development - catchment treatment - determining command area - etc.	No. of labors (man days)	e.g. 100% of each watershed under conservation measures			
3	Demonstrations - crop demonstration - PTD - Irrigation equipment demonstration - Drip system - Post-harvest technologies e.g. Defused Light storage/DLS etc.					
4	Inputs Required - Hybrid seeds (e.g. Maize, vegetable etc.) - fertilizers - pesticides kg/ compost - etc.					
5	Irrigation implements/ irrigation farm tools					
6	Trainings Male farmer Female farmer Committees					
7	Community mobilization field days farm visits field trips experience sharing posters, leaflets development - farm broadcast					
8	Monitoring and Evaluation					

Irrigation sub plat forum / irrigation servicecommittee (ISC)

- ☞ Woreda agricultural office organized ISC meeting;
- ☞ ISC assist Irrigation office emphasizing irrigation extension approaches;
- ☞ ISC meets at least four times during irrigation season;
- ☞ They coordinate among other irrigation service providers such as AEP, AIOMP, IDDP, ACSI, Research Centres, Inputs Dealers, Market Association, Irrigation Cooperatives, Farmer Associations and NGOs and other relevant stakeholders;
- ☞ Woreda ISC may also have a role in developing specific ideas for collaboration and linkages between other agencies

9.1. Collecte data & information to Plan

- High quality plans are made on the basis of relevant high quality information;
- Information about the current situation in the irrigation includes:
  - Market outlets and market price of agricultural outputs
  - population data of irrigation farming community
  - agro-ecological information
  - cropping patterns and cropping intensity
  - monitoring results
  - storage facilities of farm produces
  - availability of local irrigation vendors for supplying equipment
  - evaluation results of various surveys
  - understanding of irrigation extension service providers and other stakeholders in the operational area and their strengths and weaknesses
  - Irrigation policy and guidelines emphasizing irrigation extension approaches
  - any irrigation extension initiatives or priorities
  - Woreda and regional BoA budgeting criteria

9.2. Conduct Woreda Planning Workshops

- Planning workshop is organized,
- Woreda staff and other relevant members should attend the workshop,
- Workshop has three sessions:
    a) Consideration of planning information,
    b) Generation of outputs, outcomes and impacts,
    c) Selection of irrigation extension activities

9.3. Conduct & Prepare Detaile Woreda Irrigation Plan Format

- After the Woreda planning workshop, Woreda experts completes the Woreda planning form (shown below);
- The section in the form corresponds to the sessions of the Woreda planning workshop;
- A descriptive version of irrigation planning document needs to be prepared detailing out the implementing strategies of major activities that will be carried out;
- The plan should be submitted to Zone ISC for review and approval

Look Woreda Irrigation Planning Activity Form (Sample) on Annex D.

9.3.1. Conduct & Prepare Detaile Zonal Irrigation Plan Form Zonal Irrigation Service Coordination (ISC) sub-platform of ADPLAC

- Zonal ISC is formed with representatives from relevant stakeholders to assist the implementation of irrigation programs,
- The main function of Zonal ISC is to review Woreda irrigation plans before submission to region; review the activities in Woreda plans, and to plan zonal activities.

9.4 Consolidate Annual Irrigation Development Extension Plan & Budget at Zonal Level

- Zone consolidate the irrigation extension plans of Woreda to be implemented to support the Woreda irrigation plans,
- Include preparing bulletins, fairs, demonstrations, training Woreda experts.
- The consolidated plan is forwarded to region for approval

9.5 Regional Irrigation Service Coordination (ISC)

- Regional committee provides an overview of its function and how they create linkage with irrigation extension service providers including farmer association,
- Regional has a key role for reviewing potentially inappropriate strategies or technologies included in the consolidated plan submitted by zone,
- Regional ISC approves the draft plan with comments for adjustments.

9.6. Adjust the Consolidated Irrigation Development Extension Plans and Budget

- Adjustments could be of the following types:
  - deleting activities
  - adding additional activities
  - adjusting the detail of existing activities, if required
- Any adjustments made should not deviate from WUINA results;
- Zonal plans are consolidated based on the comments from regional ISC,
- All data be entered into the computer using extension planning software;
- During data entry, zonal staff (the person who is responsible) checks each planned activity to make sure that it has the correct code number;
- Once data entry is completed the zonal offices improved the draft plans and produces its final version of each Woreda;
- Approved version of Woreda plan is sent to respective Woredas for implementation

9.7 Conduct TOT for Technical professionals

- Irrigation extension plans and the activities that comprise the plans are implemented by Woreda experts and IDAs
- There are chiefly two types of skills: a) technology skills, and b) extension skills.
- Trainers should have adequate and practical knowledge and skills,
- Training is provided to Woreda experts on irrigation extension.

9.8. Conduct Irrigation Development Extension Training in Woredas

- Irrigation extension training is planned locally the same way as TOT training,
- IDAs are main participants,
- Support includes videos, flip charts and posters and annual extension planner,
- IDAs are responsible for on-the-job training to-irrigation water users.

9.9. Implementation Strategy and Monitoring

- Implementing irrigation extension activities from plan and follow-up activities recorded in IDA's extension diary is the key to successful extension work,

- It is important to recognize that monitoring data collected during implementation is an essential component of the planning process.

9.10. Evaluating Irrigation Extension Program

- Evaluation includes analysing the monitoring information recorded during the implementation.
- Evaluation should take place after each season to;
    - check whether objectives have been achieved
    - check whether objectives were appropriate
    - identify any particular strengths
    - identify whether there were weaknesses

9.11 Develop Annual Estimated Budget Report

- Advance budgets are prepared by the respective Woreda offices.
- These are sent to the respective Woreda Administration for pre-approval
- Finally, the estimated budget is approved and funds are allocated on item-wise.

9.12. Federal Irrigation Service Coordination (ISC)

- Federal committee provides an overview of its function and how they create linkage with irrigation extension service providers including farmer association,
- Federal has a key role for reviewing potentially inappropriate strategies or technologies included in the consolidated plan submitted by zone,
- Federal ISC approves the draft plan with comments for adjustments

Gender Box 9. Planning of Irrigation Extension Activities

What are the issues of gender inequity?

Women issues not identified fully and lack attention during irrigation extension activity planning ,

Gender experts at different level not be part of the review and approval of irrigation extension plans by region and irrigation training plan not be disaggregated

Existing local and regional gender structures (women association, women development group, micro finance institutions) not consulted during planning of irrigation activities.

How can the gender issues be addressed?

Ensure that all experts at all level have the necessary capacity to systematically integrate women and men concern equally and review irrigation extension plans from gender perspective to fully consider women's and men's concern equally at all stages from planning to implementation and evaluation.

Plan and work in consultation with different structures dealing on gender issues

What will be the benefits when gender issues are addressed?

Experts at all level are aware of existing gender gaps they can put conscious and systematic effort in developing and implementing gender sensitive and responsive activities planning and women and men concern are likely to be addressed to achieve sustainable adoption of improved irrigation practices and technologies.

CHAPTER-10
IRRIGATION EXTENSION MONITORING, EVALUATION AND LEARNING TOOLS

This chapter describes the tools and techniques of monitoring and evaluation related to conducting monitoring and evaluation of irrigation-extension activities in SSI schemes, community water pond and MI. The M&E tools also set for improving the quality of measuring impacts of irrigation extension services. It provides guidelines for reporting extension outputs, satisfaction with extension services, and some outcomes. It also describes strategies for improving evaluation practice across numerous facets of irrigation extension evaluation. The chapter concludes by reiterating the importance of building local extension evaluation capacity and re-emphasizing the need for disseminating and using results to improve extension programs/services and their impacts.

10.1. Relevance of Irrigation Extension Monitoring

Monitoring helps to ensure that extension programs are implemented in accordance with its design and objectives. It answers questions such as “Are we doing the right thing?” and “Are we doing it right?” by considering timeliness, place, person, right method/ procedures/steps. Irrigation Development agents,kebele agricultural office head/supervisor irrigation Extension , experts and/ or extension team leader / director use monitoring to track progress by gathering periodic information on intervention inputs and activities based on data. They generally, track resources and processes e.g., occurrence of meetings, demonstrations, field days, experience sharing visits etc.

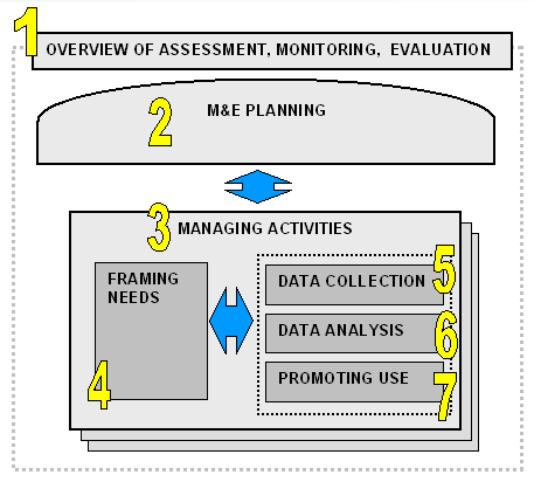


Figure- 8 - An overview of Assessment, Monitoring and Evaluation

Extension directorate, team, Subject Matter specialist(SMS), supervisor/ kebele office head are supposed to undertake monitoring and evaluation. These units gather periodic data on several general output variables, irrigation water source, including number of female and male participants, types of extension activities implemented, irrigation crop pattern, cropping calendar, and irrigation input demand, input distribution, irrigation potential land, irrigation land cultivated, market information, ongoing and emerging irrigation training needs of farmers, provision of irrigation farm tools, etc. However, public extension services have not been able to make full use of monitoring data for specific program improvement and personnel management purposes. Monitoring of program performance and impact evaluation are related, but they require different methods and levels of rigor. Monitoring tracks key indicators of progress over the course of a program to provide contextual descriptions as a basis on which to evaluate outcomes of irrigation practices. . There are ten principles for successful and effective irrigation extension monitoring, those are:

- Irrigation extension monitoring must be simple - a complex or complicated monitoring system is self-defeating.

- Irrigation extension monitoring must be timely- timeliness is critical so that appropriate modifications in irrigation extension can be made soon enough to increase chances for success. E.g. demonstration site selection, FTC training need assessment, demonstration, field day etc

- Irrigation extension monitoring must be relevant - monitoring must match objectives, generate useful information.

- Irrigation extension monitoring information should be dependable - management/ researchers, extension experts will rely on monitoring findings only if the information is believed to be reasonably accurate. E.g. data collected on demonstration sites, technology fair feedbacks, scaling up practices, etc.

- Irrigation extension monitoring efforts should be participatory - it should include all stakeholders concerned with extension (e.g., Farmers(women/ men/youths, IDAs, subject-matter specialists, etc.)

- Irrigation extension monitoring must be flexible - it is iterative in nature, and becomes routine over time.

- Irrigation extension monitoring should be action-oriented- it should follow pragmatic approaches, keeping requirements of extension's beneficiaries uppermost in consideration.

- Irrigation extension monitoring must be cost-effective.

- Irrigation extension monitoring efforts should be policy/decision makers oriented- monitoring units should keep in mind requirements of policy/ decision makings when designing and operating a monitoring system.

- Irrigation extension monitoring units represent specialized undertakings- monitoring is not merely concerned with the collection and analysis of data, but with diagnosing problems and suggesting alternative practical solutions. E.g. community need, scheme design, input provision, marketing, etc.

10.2. Relevance of Irrigation Extension Evaluation

Evaluation is not a new concept; it is something we all do, informally or formally. Evaluation is a process of systematically assessing the operation and/ or outcomes and impacts. of a program or project by collecting evidence to determine if certain acceptable standards have been met and to answer other relevant questions. This implies that there must be clear, measurable objectives for irrigation extension prior to its implementation. Evaluation results based on these predetermined objectives, as well as assessments of unintended consequences, are used to improve. Informal and formal evaluations can anchor two ends of a continuum. At one end of the continuum, informal evaluations are unsystematic; criteria and evidence used in making judgments are implicit and often personal. They can be biased and misleading. At the other end, formal evaluations are systematic and use explicit criteria and evidence to make judgments about a program's relevance, effectiveness, efficiency, and/or impacts. Findings are made public, a policy makers to design irrigation extension strategies or review and validate the existing.

Irrigation Extension evaluation focus is on effectiveness of an interventions i.e. extension approaches, FTC training, technology packages, demonstrations, educational tours, projects, or policy etc., in meeting their objectives. Resource Effectiveness- analysis of benefits and costs of an intervention, including cost per beneficiary(farmer), extension services delivery, etc on which programs, policies,

and practices are most effective with different target groups (e.g., women, youths, IWUA/nonmembers, individual farmers etc). It also measure how users of irrigation extension services perceive service quality, or their intention to use new information and/or technology. Extension evaluation is therefore both an art and a science. The art of evaluation involves identifying purposes and audiences, creating appropriate designs, and interpreting data about an intervention program or policy. The science of evaluation involves systematically gathering and analyzing evidence about the outcomes and impacts.

10.3. Challenges of Irrigation Development extension evaluation (Extension is Complex and Evaluation is Messy)

It is difficult to attribute specific impacts at the farm level to extension services because many factors affect the performance of irrigation extension services. Such factors include irrigation land relocation, irrigation input provision & timely availability, IWUA functionality, farmers awareness level, market infrastructures, IDA and extension staff motivation etc.

Irrigation-extension intervention evaluators should be able to identify cause-and-effect relationships between an activity designed to induce change (such as on farm demonstration and home garden and FTC) and a particular desired outcome (e.g. increased vegetable consumption resulting in improved nutrition of family members). Understanding of such relationship/Cause and effect requires good evaluation design and statistical knowledge to analyze impact assessment data. Absolute accuracy is neither necessary nor attainable.

Therefore, Irrigation extension evaluation should be structured to serve as a learning process. Irrigation extension evaluation is useful only to provide credible evidence to inform real decision-making at extension intervention policy, strategy and approach level.

Determining cause-and-effect relationships may require experimental or quasi-experimental research designs in which an experimental group(s) receives a specific treatment(s) while the control group receives no treatment. Use of a control group (also termed a comparison group) enables evaluators to discount many alternative explanations for the effect of the treatment. Therefore,

comparisons are essential in scientific investigations. In the case of irrigation extension, comparing farmers receiving extension services with an equivalent group receiving no extension services makes it possible to draw well-supported conclusions. However, to guide such evaluative studies, the irrigation extension staffs and policy makers must understand basic research designs, gather sound data, and use statistical tests to determine if changes are due to extension intervention. However, irrigation extension evaluation does not inevitably ensure that results will be used for intervention improvement. Thus, policy makers may consider many factors that influence the use of evaluation results through triangulating information about an irrigation extension program from advisors, colleagues, farmer organizations, interest groups, and/or the media.

10 .4. Measuring growth of Irrigation Development Extension Services

Evaluators of agricultural extension services and programs have a variety of methodological approaches from which to choose, depending on the context, the length of implementation, purpose of the evaluation, and logistical constraints. A pre- and post-program evaluation can explain whether the program has had any effect on the participants. Two sample evaluation questions for a pre-/post-program assessment could be: Do irrigation farmers who attend training adopt irrigation full package than those who do not? Do farmers who attend extension training generate a higher net income per hectare than those who do not?

10.4.1 Effective Irrigation Development Extension service Performance indicators

When objectives are met, and indicators are used then it determine the level of success. Monitoring is the process of recording these indicators, while evaluation is analyzing the recorded indicators and determining how to improve performance in the future. Using monitoring and evaluation tools is able to ensure that the implementation of irrigation extension programmes follows their design and takes into account the interests of farmers. Effective monitoring and evaluation should provide relevant and accurate information, to the right people, at the right time, in the right format, to enable them to take timely decisions and action.

Irrigation extension performance indicators are measures of irrigation extension impacts, outcome, output and inputs that are monitored during extension activity implementation. Indicators are used later to evaluate extension impact success. Organize information in a way that clarifies the relationships between irrigation extension intervention inputs, outputs, outcomes, and impacts, and that help to identify problems along the way that can impede the achievement of the intended objectives. There are various extension monitoring and evaluation indicators. However, following are the most common irrigation extension monitoring and evaluation indicators.

10.4.2. Indicators and Tools to evaluate irrigation Development extension value

Adoption of new technology and practices: this indicators shows the improvement of knowledge, skill and change in attitude of a farmer to learn, understand and apply new way of doing things to improve his/her production and productivity at any form. For example, improving produce quality/quantity, post-harvest etc.

Irrigation extension Efficiency and effectiveness measures indictors

Reduced Cost: This indicator measures the money saved by a participant due to irrigation-extension technology application. The cost could be in time, labour and other types of resource.

Savings: Similar to reduced cost, this indicator identifies the amount of savings or increased savings attributable to implementation of irrigation farming or other practice learned from an irrigation extension program.

Increased Income: This indicator compares the income of an individual farmer/ family due to irrigation extension intervention that participants earn before and after the program. For example, a farmer's income may increase because of full package application i.e. planting improved variety of Potato or Tomato that has a higher yield per hectare, or because of value-added practices such as use of implementation of organic farming practices implemented because of irrigation extension information or training.

Increased Productivity: This indicator is derived by computing economic value by measuring the increase in productivity by the same amount of land or units of production due to adoption of a new practice learned from an extension

program or demonstration. For example, extension programs teach farmers how to use a new technology. The higher profits from use of the new technology minus the cost of buying the technology equals increased productivity.

Value added: This indicator refers to the additional profit, or value, assigned to an irrigation commodities t that is used in a new way, or processed in a way that adds value beyond the cost of the processing. For example, an irrigation extension program that teaches horticulture producer farmers to use improved seed enables farmers to add value to his/her produce quality.

Alternative Opportunity Cost of Capital: irrigation extension programs can teach participants how to optimize/make more money by using existing capital (land, labor & management) in different or more efficient ways. For example, land could be used to grow a higher value crop. The income from the higher value crop is compared to the income from the relatively lower value crop to estimate the economic worth of the extension program that made farmers aware of and assisted them in changing to the new, higher value crop. During this, the extension program may provide market information; assist farmers to prepared business plan etc.

Willingness and capacity to Pay: farmer's willingness to pay to new technology/ skill sprang from understanding of economic value of adopting and application of new technologies, knowledge, skills. Some item or service may be considered an economic benefit when this willingness exceeds what would be considered a standard norm for a product or service. If the price of a product is marketed more effectively, is a value-added product, or reaches a new niche business because of extension training or assistance, this willingness to pay can be considered the value of the extension services.

Environmentally friendly effect - this will indicate the positive and negative impact of irrigation extension technologies or practices etc.

In general, the monitoring of irrigation-extension activities are conducted during implementation while evaluation is usually conducted after implementation. Monitoring comes first because without collecting information a valid evaluation is not possible. However, monitoring will only produce its full benefits if the collected information reviewed to learn lessons.

Information for planning irrigation extension activities comes from both evaluation and Irrigation water users Information Needs Assessment (IWUINA), the absence of either source of information will lead to low quality planning. In

irrigation extension planning process, monitoring and evaluation are tools to help Woredas, zone, region improve their performance. Monitoring and evaluation of irrigation activities are self-assessment processes, which need to be carried out by irrigation extension experts and other external stakeholders. There are two kinds of monitoring and evaluation important in ensuring effective participatory irrigation extension: assessment of process and assessment of outcome.

10.4.3. Conduct Assessment of Irrigation Development Extension process

The assessment of process is usually conducted during pre-feasibility stage of Participatory Irrigation Development Management (PIDM) for implementation of irrigation schemes for information collection of extension activities and about technology adoption. The process is generally a formative in nature, but can also be summative, for example, when the irrigation water users and extension experts need to know about the actual performance and successes on technology adoption in line with work planning. This assessment process of monitoring and evaluation is accomplished by conducting Technical Audits, these included:

- Scheme feasibility assessment and recommendation document
- IWUINA
- Annual irrigation extension planning
- Demonstrations and irrigation water user training register
- FTC trainee registration and graduation documents
- Monthly work schedules and IDAs extension diaries
- Monitoring reports

Strength of the Process

Following are the some points on the strengths of process monitoring and evaluation is:

- Knowledge gained about the process that led to desired or undesired outcomes can feed into future adoption of irrigation technology;

- Process can incorporate and cater for unexpected happenings,

- Process can inform IWUA and relevant stakeholders what is going-on at scheme level, as it is common for plans to change considerably;

- Process monitoring, if done collaboratively, can strengthen a common understanding of irrigation extension program aims, objectives and purpose.

The Technical Audit

The purpose of Technical Audit is to monitor the implementation of all irrigation extension activities undertaken in SSI, community water pond and MI schemes. In this regard, irrigation-extension experts(SMS) and IDAs will undertake Technical Audits to monitor on a fortnightly and a daily base respectively.

- How the irrigation activities have been planned;
- How they are being implemented;
- Whether progress is being monitored by IDAs, IWUA, Farmers Research Group FRG.

The monitoring program/schedule is however subject to the nature of the irrigation activity. i.e.

A Technical Audit has two main aims:

- To identify any misunderstandings and uncertainties amongst the irrigation water users, FRG, or IDAs regarding the processes of irrigation extension approach.

- To ensure that extension experts are discharging their responsibilities assigned to them.

The Technical Audit Checklist is designed to help irrigation-extension experts to get an impression of the quality of implementation of SSI schemes, community water pond and MI. These are not exhaustive and irrigation-extension expert or IDA is free to add any further enquiries that they consider are necessary to get an accurate and comprehensive picture of various scheme's implementation. The following is the summary of technical audit that needs to be conducted on a fortnightly and daily basis for SMS and IDA respectively.

Table- 15 - Irrigation Extension Monitoring

Indicator	Indicator verification	Comments/ suggestions for future improvement
Do the Irrigation scheme, HHMI, community water pond have Agricultural Development Plan (ADP)	Are the irrigation extension activities based on monthly work plan	
	Does it conforms to the needs (e.g. TNA) of target irrigation water users and HHMI families	
	Does the irrigation and HHMI sites conforms to the initial EIA	
	Are the irrigation activities gender sensitive	
	Does the ADP have a copy of minutes of monthly meetings	
Training events for irrigation water users & HHMI beneficiaries	How many training events on SSI, community water pond, HHMI land preparation and on farm water management , full package, irrigation Value chain& marketing, O&M, nursery management, pest and disease, post-harvest management, etc. have been planned and completed	
Farmers trained	# of male and female farmers registered	
	# of male and female farmers who completed the training course more than 90% of the session	
	# of male and female farmers who completed 70-80% of training session	
	# of farmers (M/F) who completed below 70% of the irrigation full package training	
	# of farmers(M/F) completed and graduated (i.e. fulfill CoC/ occupational of competency certification)	
Irrigation extension implementation	What type of problems, if any, was encountered at SSI/HHMI/ community water pond sites, and what remedial measures was given by IDA / irrigation extension experts	
	What type of problems, if any, was encountered in FTC, and what remedial measures was given by IDA / irrigation extension experts	
	What type of problems, if any, faced in distribution of inputs and marketing, and what remedial measures was given by IDA / irrigation extension experts	
	What opinions were given by IWUA,HHMI and community water pond and non-members on the problems	
	# of Farmers' field days/ or visits by farmers and stakeholders at SSI, Community water pond &HHMI sites were organized, and what was the total number of participants(M/F)	

Awareness	# of M/F farmers got irrigation extension awareness services	
Visit and experience sharing visit (i.e. Farmers to farmers etc.)	# of IDA/irrigation experts visit to farmers in a daily, week/month	
Field trip	# of male and female farmers who attended the field trip	
Farmers training	# of M/F farmers trained on irrigation by topics e.g. Full package, O&M (canal/HHMI etc.) post-harvest management, market etc. # of IWUA training on O&M, Finance management, Conflict resolution, input demand collection distribution, market information	
IWUA committee	# of meetings and type of agenda discussed (i.e. minutes) conducted with IDA, IWU committees , experts etc.	
FTC training regularity	# of training days per week/ month and its regularity (%) if any	
Demonstration	# of irrigation demonstration conducted by type SSI/ MI, community water pond , in FTC, on-farm, ATVET	
Field day	○ # of Farmers' (M/F) field day organized on irrigation SSI/MI, community water pond, ATVET, FTC etc. ○ Type of comments and recommendation ○ # of institutions/ stakeholders involved in the farmers field days	
Supervisions/Job Embodied Support (JES)	○ # of supervision/JES provided to farmers, IWUA, IDADA in a daily/ week/month, ○ Type of support and recommendations	
Research extension farmers linkage (REF)	# of REF linage workshop organized in a monthly/ quarter/year Agendas discussed and recommendation # of institutions involved	

10.4.4. Conduct Assessment of Irrigation Development Extension Outcome

The assessment of outcome needs to be carried out toward the end of each SSI & MI schemes that is aimed at assessing the usefulness and effectiveness of the appropriate technologies generated and demonstrated on SSI&MI structures and homestead farming, management of irrigation schemes and introduction of improved crop cultivars and water management. Such assessment of outcome is undertaken to know the performance of irrigation extension approaches to establish whether the desired outcomes have been reached. The outcome

is generally summative, but may be formative when the findings are used to improve future irrigated agricultural farming.

The above indicator (Process indicators) shows merely events and is not such detail. Composite indicators are developing to understand the event & its outcome/results. Arithmetic average of selected extension effectiveness indicators, say, awareness indicator (know the DAs), visit indicator (number of visits twice a month), IWUA indicator (meeting place at farmers' fields), and regularity indicator (visit on the same day) can show the impact of the evens. Hereunder are some critical irrigation extension impact/outcome evaluation indicators.

Table- 16 - Irrigation Extension Service Efficiency Monitoring Indicator

IRRIGATION EXTENSION SERVICES EFFICIENCY MONITORING INDICATORS	
Irrigation Extension Performance Index (IAEPI) in %	Actual number of farmers reached (Z) out of the target number(Y) which should be reached IAEPI. i.e., Z / Y*100 = IAEPI Where: Y is the total # target farmers, Z is actual # of farmers reached & IAEPI irrigation extension services performance index in percent
Irrigation Extension Diffusion Index (IEDI) in %	# of farmers adopted recommended practice (A) out of the actual # of farmers reached (Z) in percent. i.e. A/Z*100 = IEDI where: Z is the actual farmers reached, A is # of farmers adopted recommended practices and IEDI is irrigation extension diffusion index in percent
Irrigation Extension Actual Achievement Index (IEAAI) in %	Number of farmers adopted recommended practice (IEDI) out of target number of farmers(Y). i.e. IEDI/Y*100 = IEAAI Where: IEDI is irrigation extension diffusion index, Y is the total # target farmers and Irrigation Extension Actual Achievement Index (IEAAI)

10.4.5. Framework of Irrigation Development Extension Evaluation

Evaluation of irrigation extension approach can employ more than one form. An evaluation strategy for irrigation extension includes four different forms of evaluation. This section underpins on more irrigation extension 'approach-focused' view of evaluation, and reviews some of frameworks to use to form an integrated evaluation plan for all irrigation extension activities.

10.4.6 Irrigation Development Extension Evaluation Indicator (Impact Evaluation)

Table- 17 - Irrigation Extension Impact evaluation (sample)

IRRIGATION EXTENSION IMPACT INDICATOR	
yield/ production	yield per hectare for high value irrigated commodity (average)
productivity index	increase in yield over base production year compared with base year (ha) in percent. this can be done according to irrigation seasons.

10.4.7. Conduct M&E on Irrigation development Extension

A team of Irrigation extension subject matterspecialist that includes horticulturalist, agronomist, protection, post-harvest, market, extension, input providing cooperative agencies, natural resource management, irrigation engineers, socio economist, livestock experts, geologist soil experts and other SMSs based on M&E objectives can conduct extension M&E. . The prime task delegated with M&E section may include:

Baseline Surveys: Under baseline surveys, data as to agricultural and socio-economic characteristics of beneficiary farmers are collected before the implementation of the scheme to facilitate future monitoring and evaluation. The beneficiary irrigation water-users should be selected based on a systematic stratified random sampling procedure. A requisite number of sample beneficiaries

(respondents) should be selected for baseline survey in each scheme area, HHMI and community water pond.

The sampling procedure should be designed to have a representative sample of the farm households benefiting from the schemes to provide reasonable estimates of the various agricultural and socio-economic characteristics of the farm population. Baseline investigations should include all relevant cropping seasons related to particular agriculture levels and irrigation system. This is because the investigations on SSI , HHMI and community water pond productivity needs to be undertaken in a single year may result in distorted impact, particularly in areas where annual climatic features are highly erratic. Therefore, emphasis should be given to estimate irrigation production and water usage. The survey needs to be concentrated on key variables in the development of the scheme viz. agricultural, engineering, socio-economic and institutional factors.

Table- 18 - Key Performance Indicators for baseline survey (Sample)

irrigation Agronomist experts	e.g. site selection, land use pattern cropped Area; Seed, Fertilizer & Pesticide Use; Yield, Consumption and Sales etc
Irrigation water user Association	e.g. Committee effectiveness, Monthly Meetings and Annual Meetings etc
Availability of Irrigation Extension Services and Training	E.g. Extension Visits-frequency based on context of HHMI/SSI/community water pond comments on Training etc.
Present Level of Operation & Maintenance	Available water harvesting structures e.g. water tank present Irrigation Practices; period of irrigation water, O&M

Irrigated crop production Surveys: irrigation crop production surveys are done as part of baseline and seasonal surveys for those crops planted in irrigation and water harvesting schemes to ascertain the actual productivity. This will enable the crop yield comparison before and after the implementation of the irrigation schemes, HHMI or community water pond.

Irrigation cropping-Pattern:irrigation: cropping pattern refers to the proportion of area under different crops at any given point of time in a unit area, or the yearly sequence or spatial arrangement of crops on a given area. Cropping activities may run all the year round, provided water is available for crops. It may be of different types such as inter cropping, mixed cropping & crop rotation etc.

Irrigation cropping-calendar: Mapping of irrigation crop calendar is a method of interpretation of agricultural practices at local level. Irrigation crop calendar shows the raising of crops in an area throughout cropping calendar is a schedule of the growing season from the fallow period and land preparation, to crop establishment and maintenance, to harvest and storage.

It allows an irrigation farmer to plan for input purchase and use, develop cash flow budget for the year, determine need credit and period requirement, determine labor requirements and plan for peak usage times, organize contractors for land preparation etc. This is because different irrigation crops grown in different season according to fluctuation in the physical, cultural & ecological conditions, particularly the socio-economic constraints. The long practice of canal irrigation raises some problems that disturbed the crop calendar.

Irrigation scheduling: Irrigation scheduling is the decision of when and how much water to apply to a field. The purpose of irrigation scheduling is to determine the exact amount of water to apply to the field and the exact timing for application. The amount of water applied is determined by using a criterion to determine irrigation need and a strategy to prescribe how much water to apply in any situation. Furthermore, irrigation extension assistance on this will help the farmers. It enables the farmer to schedule water rotation among the various fields to minimize crop water stress, maximize yields, and hence improve IWUA effectiveness. It also reduces the farmer's cost of water and labor through less irrigation, thereby making maximum use of soil moisture storage, lowers fertilizer costs by holding surface runoff and deep percolation (leaching) to a minimum, increases net returns by increasing crop yields and crop quality. It minimizes water logging problems by reducing the drainage requirements and assists in controlling root zone salinity problems through controlled leaching and results in additional returns by using the saved water to irrigate non-cash crops that otherwise would not be irrigated during water-short periods.

Monitoring/ Seasonal Surveys: Monitoring/seasonal surveys are usually conducted for multiple cropping seasons in the areas of selected schemes, HHMI, community water pond with the objective of gathering information on a range of agricultural, institutional and hydrological characteristics, which are expected/tend to change, with a view to assess the performance of schemes, HHMI and community water pond.

Table- 19 - Monitoring /Seasonal Survey (sample)

Agriculture Irrigation Practices Cropped Area and Cropping Intensity Crop yields	Water Availability for Field Crops Extension using Irrigation in the Area that Changes in Cropping Pattern Improvement in Productivity of Crops
Irrigation water user Association and Farmer Groups	Membership; Participation; Leadership Quality; Resource Mobilization; Collective Activity and its Achievements
Irrigation Extension and Farmers Training	Frequency of visits and training ; Type of advice and Method of Training; Number and type of Demonstration Trials; and Performance of Irrigation Extension Experts and DAs
Hydrology and Scheme O & M	Water Availability and Method of Delivery; Water Supply at Field Level; Efficiency and Equity of Water Distribution; Frequency and Standard of Maintenance; Annual O&M, Expenditure and Water Charges, if any

Hydrological Studies: Hydrological studies are carried out as part of M&E of the program to relate rainfall in the catchment to changes in the tank levels including those associated with discharge from the tank. Hydrological studies undertaken in the scheme areas generally are of two types:

- Studies in the areas of schemes, HHMI, community water pond where baseline surveys completed; and

- In depth and periodical studies in the representative schemes, HHMI, community water pond areas where rain gauges, gauge plates, notches, bar graph etc., installed.

It is recommended to consider model irrigation schemes, HHMI and community water pond for evaluation with other randomly selected schemes to get a comparison of performances. However, the following points should be taken into account while conducting detailed studies/surveys:

- Surveys are required to determine irrigation water users' competence in irrigation practices and the need for training. Extension surveys are also needed to assess the possibilities of involving the irrigation water users in the improvements to be made and the organizational aspects relating to future O&M of watercourse. Special care should be taken that

extension surveys result in practical and viable application.

- Evaluating the physical improvements (tertiary canal improvements, small hydraulic structures, land levelling, irrigation methods, etc.) is relatively easy, when suitable technical information exists but even when such information is not available, a survey can be made in a reasonably short time.

- Much more complex and time-consuming are surveys to determine the efficiency of water use at the farm level. They should be undertaken for a complete irrigation season at least (under the assumption that it is climatologically representative of the average conditions). In order to know the amounts of water consumed annually, it is indispensable to set measuring devices at the farm intake. Installing them and checking on consumption is a time-consuming operation. The problem is obviously simplified in schemes where such devices are part of the irrigation network.

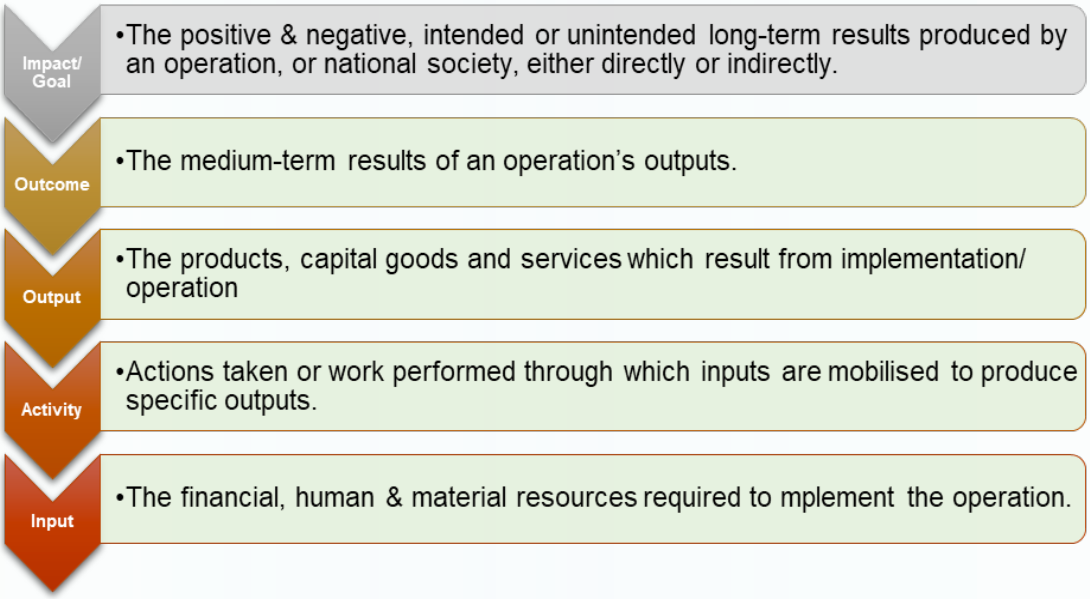
10.5. Choos Suitable Criteria & Indicators for Irrigation Development Extension Evaluation

valid and useful to the results users, we must employ sound indicators to measure change. Indicators are observable phenomena that point toward the intended and/or actual condition of situations, programs, or outcomes. They are markers that can be observed to show that something has changed or improved. Indicators, when incorporated into an appropriate extension monitoring system, can help people notice changes at an early stage of a program's implementation. Quality indicators of an evaluation process are that it must be relevant to extension objectives; simple and unambiguous; realizable given logistical, time, technical, or other constraints; conceptually well grounded; and can be updated at regular intervals.

Good evaluations start with baseline data to establish benchmarks. Baseline data are gathered before the start of intervention. Thus, having indicators identified early in a project planning process is critical. This helps to identify truly needed projects as well as to frame effective, efficient evaluations. Also critical to effective evaluation is selection of indicators that are appropriate to the project goals, objectives, and intended impacts. Examples of indicators to evaluate the effectiveness of extension programs focusing on irrigated agricultural production

would be fundamentally different from programs intended to improve nutrition, even if planting of a new high yield, healthier variety of potato or rice might result in both types of impacts.

Figure- 9 - The Result Chain



Impact to activity result chain indicates what the operation will do and what it seeks to achieve. Performance indicator and means of verification allow understanding how performance will bemeasured. Assumption and risk tell us; factors outside management control that may affect project performance.

Table- 20 - Irrigation Performance Indicator and Means of Verification

Descriptions	Performance Indicators	Means of Verification	Assumptions & risks
Impact/Goal e.g. Higher objective to which this operation, along with others, is intended to Contribute.	Impact - Indicators to measure irrigation extension programme performance.	Irrigation extension programme evaluation System	Risks regarding strategic Impact.
Outcome/ the outcome of an operation i.e. the change in beneficiary behaviour, systems or institutional performance because of the combined output strategy & key assumptions.	Outcomes- measures that describe the accomplishment of the Purpose. The value, benefit &return on the Investment.	People, events, processes, sources of data for organizing the operation's Evaluation system.	Risk regarding extension programme outcome xz

Outputs Actual deliverables. What the operation can be held accountable for producing.	Output indicators that measure the goods & Services finally delivered by the operation.	People, processes, events, sources of data supervision& monitoring system for validating the Operation's design.	Risks regarding design Effectiveness.
Activities The main activity clusters that must be undertaken in order to accomplish the Outputs.	Inputs/Resources Budget by activity. Monetary, physical & human resources required to Produce the outputs.	People, events, processes, sources of data –monitoring system for validating Implementation progress.	Risks regarding Implementation & efficiency.
Input The financial, human & material resources required to implement the operation.			

10.6 The way to Select criteria & indicators of Progresive Irrigation Development Extension and Impact Indicators

The following are major (not limited to) criteria to select extension monitoring and evaluation indicators. An appropriate, effective indicator must:

- be measurable
- be relevant to the impact being evaluated
- be easy to use
- result in representative results
- be easy to interpret
- be responsive to changing inputs
- have a reference against which to compare it
- Be measurable at a reasonable cost; and

Be updateable.

10.7. The Right method of Measuring implemented M&E and Reporting Irrigation Development Extension

Extension evaluation essentially involves measurement of indicators by collecting quantitative and qualitative data. Quantitative methods measure a finite number of pre-specified outcomes and are appropriate for wider range of extension interventions programs that intend to judge effects, attribute cause, compare or rank, classify, and generalize results. For example, impact of FTC training and demonstration, IWUA effectiveness, irrigation input provision and distribution system. These methods are accepted as credible and applicable to large populations, particularly when generalizing is important. Qualitative methods take many forms, including rich descriptions of people, places, conversations, and behavior. The open-ended nature of qualitative methods allows farmers to answer questions from his/her own experience and perspective. Qualitative methods yield good evaluation data as long as they are collected objectively and reported as unbiased way as possible.

Using mixed methods, quantitative data can be complemented with qualitative information to provide a richer description of extension intervention impacts. Validity and reliability of data collection instruments are related directly to objective measurement. Validation and reliability of the extension assessments can be improved through:

Use a panel of experts consisting of persons who are knowledgeable of the extension intervention. Panel members review the instrument in terms of its content, format, and audience appropriateness.

Check whether the extension assessment instrument consistently yield the same results with the same group of people under the same conditions

Reliability looks for consistency, accuracy, and dependability of an instrument.

Usually, reliability is established by conducting a pilot test or pre-test. Pre-testing can prevent costly errors and wasted effort.

Table- 21 - Techniques and tools used for evaluation at three stages of irrigation extension

Stage	Types of Studies	Technical Questions	Examples of Evaluation Tools and Techniques
Irrigation Extension Planning Stage	Needs Assessment Feasibility Study Baseline Study	What are farmers felt and unfelt needs? Can extension address these needs? Do they fit with irrigation extension's mission? Is the intervention socially, economically, environmentally feasible?	Surveys (e.g. individual farmers question) Focus Groups Observation Content Analysis (e.g., of office records) Economic Analysis (e.g., benefit/cost analysis)
Implementation Stage	Extension Intervention Monitoring Evaluation	Is the irrigation-extension intervention meeting its objectives of intended outcomes? Are the farmers satisfied with the intervention? Are the media delivering program messages?	Annual Monitoring Reports (e.g., staff time and activity reports, irrigation crop yield, seed & fertilizer cost) Adoption patterns for new irrigation technology Evaluative assessments of Knowledge, Attitude, and Behavior Change Farmers satisfaction surveys Content Analysis of News Releases
Impact/Results Stage	Impact Assessment Summative Evaluation	Has the irrigation-extension program intervention addressed the needs or gaps identified? Is the irrigation-extension program intervention achieved desired outcomes? Is the irrigation-extension program intervention cost-effective?	Pre- and Post-extension intervention data analysis Cohort Studies Panel Studies Surveys (e.g., personal interviews, online surveys) Economic Analysis

10.7.1. Selecte Appropriate Data Sources

Irrigation extension monitoring and evaluation data sources also are important. Monitoring and evaluation data can be gathered from primary or secondary sources. Primary sources IWUA, HHMI and community water pond, secondary

data include original policy and strategic documents, materials that combine and synthesize data from multiple primary sources e.g. report, plan. There is no one best method. Selecting appropriate data sources is based on the relative merits of each source and influenced by the type of information desired, time availability, and resources available to conduct monitoring and evaluation.

10.7.2. Carefully Selecte, Traine, and Monitore Data Collectors

Surveys and personal interviews are popular forms of data collection for irrigation monitoring and evaluating extension intervention programs. Irrigation evaluation, generally utilize more than one person to collect data. Although many factors may affect data quality, minimizing interviewer variance is critical for acquiring valid and reliable data. In addition to potential diversity among interviewers, there exists a variety of factors reflecting interviewers' interactions, and this is with interviewees, the instrument, and the interview context that might affect quality of data. Careful selection and training of interviewers can help ensure data quality and consistency. If possible, extension intervention should identify and select data collectors at the time of finalizing data collection instruments and plans.

They must understand the local culture and should have good reading and writing skills, good listening skills, and the ability to build rapport quickly. Training of data collectors is essential prior to actual data collection. Training topics should include, as relevant to a specific evaluation, an introduction to the study, role of the interviewer, confidentiality procedures, and review of the questionnaire and interview protocols, standardized interviewing techniques, probing, recording responses, gaining cooperation, and presentation of scenarios. Pre-testing or pilot testing of instruments offers an opportunity for hands-on training for data collectors.

10.7.3. Selecte Randomized and/or Representative Samples

Evaluation of extension intervention programs usually involves first-hand collection of data from people. Thus, the evaluator must make numerous decisions about the sample population then develop an appropriate sampling

plan. Rather than surveying every person in a given population (census), evaluators often survey or interview a sample of the population. Using samples is less costly in terms of time, money, materials, human resources, and effort than surveying or interviewing an entire population. Sample size and type depends on what extension intervention is to be evaluated and whether the selected methodological approach is quantitative or qualitative. Sampling methods usually are categorized in two types: random (probability) sampling and purposeful (non-probability) sampling.

10.7.4. Selecte a Sample Using Random (Probability) Sampling

Random, or probability, sampling is based on random selection of units (farmers) from the identified target population. This sampling method eliminates subjectivity in choosing a sample and provides a statistical basis for claiming that a sample is representative of the target population. Every member of the target population has a known probability of being included in the sample. Several types of random /probability sampling techniques are available to evaluators most common are simple random sampling, Stratified random sampling and cluster random sampling.

10.7.5 Analyzing Data Appropriately

Sound design and sampling of extension evaluation is necessary, but not sufficient, to ensure a quality evaluation appropriate and robust statistical analysis is critical to credible results. Choice of analytical technique depends, in part, on whether the data are quantitative or qualitative. But rigor is an essential characteristic for both.

Table- 22 - Steps of designing irrigation extension Monitoring and Evaluation

Steps	To do list
Check the operation's Design	Review and revise (and if necessary prepare) a framework Ensure that objectives for Goal (impact), Purpose (outcome), Outputs and Assumptions are clearly stated and measurable. Ensure that indicators are adequately specified with quantity, quality and time.
Assess capacity for M&E	Identify what human and financial resources are available. Assess training requirements for all monitoring staff, both from International Federation and National Societies and counterpart bodies. Specify training requirements
Plan for data collection and analysis	Check existing information sources for reliability and accuracy, to determine what data is already available. Decide what additional information should be collected, for baseline purposes, monitoring and for evaluation. Set a timeframe and schedule for data collection and processing, and agree on responsibilities.
Prepare M&E plan and Budget	Summaries agreed information needs data collection, information use, reporting and presentation in a monitoring and evaluation plan. Summaries capacity building and support requirements. Cost all monitoring and evaluation activities, and identify funding sources.
Plan for reporting and Feedback	Design the reporting system, specifying formats for reports. Devise a system of feedback and decision taking for management.

10.7.6. Quantitative Analysis

Evaluation data usually are collected in the form of numbers. Quantitative data help determine relationships or differences between variables. Correlation statistics measure the relationship between two variables, often between a dependent variable and an independent variable. Correlations are used with questions such as: Do farmers who attend irrigation-extension training on a

regular basis adopt more new practices than those who do not? Are female farmers more likely then male farmers will adopt improved seeds for their HHMI schemes?

10.7.7. Qualitative Analysis

Qualitative data are mainly narrative data that come in many forms and from a variety of sources. Sources include personal interviews, focus group interviews, key informant interviews, case studies, daily journals and Development agent diaries, documents, and testimonials or storytelling based on personal accounts of experience. Data collection primarily involves the use of participatory methods. Use of participatory methods enables inclusion in impact evaluations. Extension intervention evaluators who specialize in qualitative analysis use a method called 'content analysis. Content analysis is a systematic technique for analyzing the substance of a variety of documents, records, and open-ended survey comments. This process includes carefully reading the information, then identifying, coding, and categorizing the main themes, topics, and/or patterns in the information.

10.7.8 Communicate and utilize Findings of irrigation Development extension Evaluation

The most challenging task to transform Ethiopia's agriculture through implementation of pluralistic extension system and by providing demand-driven and market-led extension services to male, female and youth farmers is to develop useful results from the data and then to share the results with its users. Irrigation e extension directorate, team, SMS,kebele agricultural office / supervisor and other relevant stokehold have a responsibility to report evaluation findings to extension staffs and stakeholders who may have an interest in the results. Use of findings means making thoughtful and deliberate decisions based on those results. Thus, communication with stakeholders should occur throughout the evaluation process to help ensure meaningful, acceptable, and useful results. Reports, media, public meetings, workshops, bulletins, and brochures, web pages can be used to communicate the findings and recommendations as required. Find Monitoring and Evaluation Plan Achievement impact, outcome, output and input of activity of verification sample format on Annex P.

Gender box 9. **Extension monitoring, evaluation and Learning**

What are the issues of gender inequity in extension monitoring, evaluation and learning?

Lack of gender responsive extension monitoring , evaluation and learning mechanisms

Inadequate sex and gender disaggregated data on irrigation extension intervention

Limited consideration for gender responsive extension learning and knowledge sharing mechanisms

How can the gender issues be addressed?

Revise program objectives as needed to be more gender-sensitive. Set gender equality goals at impact and outcome levels, which will be monitored and assessed through gender sensitive indicators and a gender sensitive reporting strategy

Develop gender responsive monitoring tools and Set target to measure changes in terms of gender equality and the commitment and accountability of the responsible bodies

Construct gender related indicators and collect sex and genderdisaggregated data on the status of women, men and youth, capacities, challenges and opportunities to measure success of action

Capture the changes experiences by both women, men, and youth and the impact on gender relation and document practices for further learning and sharing

What will be the benefits when gender issues are addressed?

Establishing gender responsive M & E and learning mechanisms have the function of pointing out how far and in what ways advisory services have achieved outcomes related to gender equality. It measures gender related changes in society over time.

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ANNEXES

Annex A:- Example of Lesson Sheet for monthly impact points

የዕዝል ዝርዝር

ዕዝል 1. ግንኙነትን ለማጠናከር የሚደረግ የአቅም ግንባታ ድጋፍ ዝርዝር

ተግባር	የአቅም ግንባታ ድጋፍ ስትራቴጂ/ድርጊት
ዕቅድ ክለሳና ግምገማ	በክልል ደረጃ የመስኖ ልማት ዕቅድ አውደ ጥናት ላይ፡ ▪ በመስኖ ልማት ዕቅድ ላይ የጋራ የክለሳ ግምገማ ማካሄድ፤ ▪ የመስኖ ልማት ኤክስቴንሽን ዕቅድን በጋራ ማዘጋጀት፤ ▪ እቅዱ በግብርና ልማት አጋር አካላት ግንኙነት አማካሪ ካውንስል (ADPLAC) ማዕደቅ፤ ▪ የመስኖ ልማት ስልጠና አተገባበርን በጋራ ማቀድ፤ ▪ የመስኖ ባለሙያዎችን ዋና አሠልጣኞች ሊሆኑ ይገባል፤
የፕሮግራም ዝግጅትን በደርጃ ማስቀመጥ	የፕሮግራም ደረጃ የሚቀረፀው በሁኔታዎች ትንተና ላይ ነው፡፡ ይህም በመስኖ ልማት ግብርና ላይ ቅድሚያ ለሚሰጠው ጉዳይ ውሳኔ ለማስጠት በመሠረታዊነት ያገለግላል ▪ በሁኔታዎች ትንተና እና ደረጃ አቀማመጥ ቴክኒክ ላይ የዕቅድ ንድፍ ማዘጋጀት፤ ▪ ቅድሚያ የሚሰጣቸው ጉዳዮችን ለመወሰን የሚያስችሉ መረጃዎችን በተከታታይ መመርመር እና መተንተን፤ ▪ ተግባር ተኮር ስልጠናና ድጋፍ መስጠት፤
የሙያ ትምህርት	የሙያ ትምህርት ትግበራ ለሙያ ሰልጣኙ እውቀትና ክህሎን ለመጨበጥ ይረዳዋል፡፡ በዚህም፡- ▪ ባለሙያዎች ተግባሮቻቸውን በመፈተሽ ያሻሽላሉ፤ ▪ ሙያዊ እውቀትንና ክህሎትን ለማዳበርም፤መጽሐፍ ማንበብ፣ የባለሙያን ሥራን መመልከት፣ትምህርታዊ ጉብኝትና ትምህታዊ ጥናቶችን ማደርግ እንዲሁም ሙያዊ ግብን ላማሳካት የራስ ተናሳሽነትን ማሳደግ፤ ▪ አርሶ/አረብቶ አደሮች ያገኙትን ትምህርት መገምገም፤
የሃሳብ ልውውጥና እና የሀብት ማዳበር ልምድን ማሳደግ	የሃሳብ ልውውጥና እና የሀብት ማዳበር ልምድን ማሳደግ ልምድ ካላቸው አካላት ጋር የረጅም ጊዜ ውይይቶችን ማድረግ እነርሱም፡- ▪ ጥናታዊ የመስክ ጉዞን ማዘጋጀት (የሀገር ውስጥና የውጭ)፤ ▪ የክህሎት እና የአቅም ማጎልበቻ ስልጠናን ማድረግ፤ ▪ የግል/ፕራይቬት እና ጋራ/ፐብሊክ አጋርነትን ማበረታታት፤ ▪ የአካባቢ/የማህበረሰብ ማህበራትን ማጠናከር፤

የመስኖ ስራ መረጃንና ወቅታዊ ግንዛቤን ማሠራጨት	የመስኖ ልማት ስራ መረጃንና ወቅታዊ ግንዛቤን ማሠራጨት ረገድ የሚከተሉትን ተግባራት እንደ አስፈላጊነቱ መጠቀም ▪ የተጻፉ የመረጃ ማቴሪያሎችን ለምሳሌ በራሪ ጽሁፎች፣ ጋዜጦች፣ ትንንሽ መጽሀፍት፣ ተፈላጊ መረጃ የያዘ ሰነድ፣ የሀብት መመዘኛ፣ የምርምር መጽዔት፣ ሳይንሳዊ ሪፖርቶች፣ ወ.ዘ.ተ፤ ▪ የኤሌክትሮኒክ እቃዎች ማለትም ዲቪዲ/ ሲዲ ሮም፣ የኢሜይል ምልዕክቶች፤ ▪ በኢንተርኔት የሚገኙ የእውቀት ማቴሪያሎች፣ የምርምር ፍንጮች፣ ትክክለኛና የተመጠኑ መልዕክቶች፣ ዌብ ኮንፈረንስ፣ እና ዌብ ሳይትስ፤ ▪ የአጋር አካላት ሽርክና እና ጉባኤዎች/አውደ ጥናቶች፤
የሙያ ተግባራትን ማስተባበር	የአርሶ አደር ድርጅቶችን ጨምሮ የአካባቢ የሙያ ድርጅቶችን ለመደገፍ የትብብር ስትራቴጂን ማሳደግ ▪ ያሉትን የሙያ ድርጅቶች መለየት (የአርሶ አደር ድርጅቶች፣ ማህበረሰብ አቀፍ ድርጅቶች፣ የግብርና ማህበራት ወ.ዘ.ተ)፤ ▪ አዳዲስ የሙያ ድርጅቶችን መመስረትና መደገፍ፤ ▪ የድርጅቶችን የልማት አጭር የሥራ ዕቅድ እና መተዳደሪያ ደንብ ማስጣት፤ ▪ የሙያ ማህበራትን አቅም ግንባታ መደገፍ፤

LESSON SHEET for monthly Impact Points (extension messages)

Period: _____ to _____ (4 weeks)

Name of the irrigated crop: Wheat

Impact point: Sowing of seed

Sub-Impact Points: Quality of seeds

Better use certified seeds

Farmer's own seed should have at least 80% germination rate

Germination can be tested by petri-dish method or by rag-doll method

Seeds should be screened through sieves for removing weed seeds

Seeds should be treated with fungicides to control seed-borne diseases like wheat smut.

Detailed impact points:

Time of sowing: Optimum time for sowing is from beginning of December up to end of December. If the atmospheric temperature remains high, sowing should be delayed to the middle of January.

Method of Sowing: Selection of land: a good seed bed gives healthy,

It is better to sow in lines 7 to 8 inches apart by seed drill or behind the plough placing the seeds 1.5 to 2 inches in depth in irrigated condition;

In irrigated land, the sowing seed requirement for improved variety is 132 kg to 145 kg per ha;

If, after sowing, the land appears dry and lacks moisture, it will be useful to apply a slight splash of moisture (light irrigation) to the top 2 inches of soil to ensure uniform germination.

Audio-visual for classroom discussion: pictures, drawings, flash-cards, posters, film-strips showing methods of sowing, uniformity of sowing, depth of sowing

Practical: The IDAs are given practical in:

Screening of wheat seeds by sieves to examine the presence of weed seeds

Testing germination percentage in Petri-dish or rag-doll methods

Treatment of seeds by fungicides

Sowing of seeds in lines with seed drill and behind the plough method

Materials for training: Blackboard, wheat seeds, sieves, Petri-dish, rag-doll, fungicides, containers for seed dressing, seed drill, plough, ropes, pegs, etc.

Annex B:- A complete Training Lesson Plan (a Sample)

ዝርዝር	የድጋፍ ተግባራት	የድጋፍ /የአሠራር ዘዴ	ሀላፊነት የተሰጠው ተቋም
የመስኖ ቴክኖሎጂ ልማት	የመስኖ ምርምር አጀንዳ መቅረጽ	ችግሮችን በጋራ መለየትና በደረጃ ማስቀመጥ፣ የአፈጸጸም ግምገማን በጋራ ማካሄድ፤	የምርምር ተቋማትና የሚመለከታቸው የትምህርት ተቋማት/ ዩኒቨርሲቲዎች
	በተለዩ የአነስተኛና ጥቃቅን የመስኖ ልማት ቴክኖሎጂዎች ላይ ግንዛቤ መፍጠር	የአርሶ/አረብቶ አደር ንቅናቄ፣ የተለያዩ ብዙሃን መገናኛ፤	ግብርና ቢሮና የግብርና ምርምር ተቋም፤
	የቴክኖሎጂ ማረጋገጫ	አሳታፊ የቴክኖሎጂ ልማት ሙከራዎችና ሠርቶ ማሳያዎችን በመጠቀም በጋራ የማላመድ ሥራ ማከናወን፤	ምርምር፣ ግብርና ቢሮ፣ የግል ሴክተር፤
ቴክኖሎጂ ማባዛት	ቴክኖሎጂ ማባዛት	ቴክኖሎጂውን የሚያባዛ ተቋም መስራች ዘር፣ ማባዣ ማዕከል፤	የምርምር ማዕከላት፤
	ፍላጎት መፍጠርና ግብረ መልስ	የዳሰሳ ጥናት ማካሄድና የመስኖ ውሃ ተጠቃሚዎች የቴክኖሎጂ ፍላጎት መለየት፤	የዞን ግብርና መምሪያና የምርምር ጣቢያ፤
ቴክኖሎጂ ማሰራጨት	የመስኖ ልማት ኤክስቴንሽን ማዘጋጀት	የመስኖ ልማት ኤክስቴንሽን ምክረ ሀሳብ በጋራ ማዘጋጀት፣ ስልጠና መስጠት፡ ክትትልና ግምገማ ማድረግ፤	የክልልና የዞን የመስኖ ልማት አገልግሎት ማስተባበሪያ፣ የወረዳ ግብርና ጽ/ቤት፣ የምርምር ማዕከላት፤
የመስኖ ግብዓቶች	የመስኖ ተጠቃሚዎች የግብዓት ፍላጎት መለየት	ምርጥ ዘር፣ ማዳበሪያ፣ ተባይ ኬሚካል፣ብድር፣የእርሻ መሳሪያዎች አቅርቦት	የኢትዮጵያ ምርጥ ዘር ኢንተርፕራይዝ፣ የግብርና ግብዓት አቅርቦት ኢንተርፕራይዝ ህ/ሥራ ማህበራት
ብድር	ለአነስተኛና ሰፋፊ መስኖ ተጠቃሚዎች የመስኖ ልማት አገልግሎት ብድር ማፈላለግ	የመስኖ ልማት በሚካሄድባቸው አካባቢዎች የብድር አቅርቦት እንዲኖር ማስቻል	ህ/ሥ/ማህበራት፣ የገጠር ባንክ
የውሃ ተጠቃሚዎች ማህበር	የአቅም ግንባታ	የመስኖ ውሃ ተጠቃሚዎች ማህበርን/ቡድን ለማጠናከርና የተቀናጀ ስልት መቀየስ፤	ህ/ሥ/ማስፋፊያ ኤጀንሲ፣ የመስኖ ማህበራት
	የመስኖ ውሃ አስተዳደር	በየደረጃው ላሉ የመስኖ ውሃ ንዑስ ቡድኖች ፍትዊ የመስኖ ውሃ ሀብት ክፍፍል፣ የመስኖ ውሃ ቁጠባ መተዳደሪያ ደንብ	ህ/ሥ/ማስፋፊያ ኤጀንሲ፣ የመስኖ ማህበራት
	ገበያ ማመቻቸት	ገበያ ተኮር ሰብሎችን ማማረት የገበያ ቦታዎችን ማማቻቸት	የግብርና ግብዓት አቅርቦትና ግብይት፣ ህ/ሥ/ማስፋፊያ ኤጀንሲ

የጥገና አጋልግሎት	ለአነስተኛና ጥቃቅን መስኖ እና ለማህበረሰብ ኩሬ ውሃ ተጠቃሚዎች	የመስኖ መስመር ጥገና፣ የመስኖ ቦይ ዕዳትና ማንጣፈፍ ሌሎች የማስተካከያ ሥራዎች	የመስ ውሃ ማህበራት የጥቃቅን መስኖ ተጠቃሚ አርሶ/አርብቶ አደሮች የወረዳ የመስኖ ጽ/ቤት፣ በሁሉም ደረጃ የመስኖ ልማት አገልግሎት ማስተባበሪያ መለስተኛ መድረኮች
ክትትልና ግምገማ	ክትትልና ግምገማ	የጋራ ክትትል፣ ግምገማ፣ መማማር፣ ግብረ መልስና እና ወቅታዊ ሪፖርቶች	በሁሉም ደረጃ የመስኖ ልማት አገልግሎት ማስተባበሪያ መለስተኛ መድረኮች ይከናወናል።
የመስኖ ልማት አውደ ጥናቶች	ፊደራል፣ክልል፣ በዞን፣ በወረዳ ደረጃ የሚካሄዱ አውደ ጥናቶች	ፊደራል/ክልል/ዞን/ወርዳ የመስኖ ዕቅድ ክለሳ /ግምገማ የግብዓት አቅርቦትን ማረጋገጥ፣	የፊደራል/ክልል/ዞን/ወርዳ ዳይሬክቶሬት መስኖ አገልግሎት ማስተባበሪያ፣ ግብርና ቢሮ፣ የውሃ መስኖና ኢነርጂ ቢሮ፣ ግብርና ምርምር፣ ህ/ሥ/ ማስፋፊያ ኤጀንሲ

PREPARED BY:

Name	Name of Woreda	Date
Name of IDA	West Belessa	3 December 2010

PROPOSED TRAINING SESSION

Date	Location
Wednesday, 15 December 2009	FTC in Zana Kebele

TRAINING SYNOPSIS

TRAINING TITLE: Techniques of germination test for maize seeds
LEARNING OBJECTIVE: By the end of this training the irrigation water user leaders will be able to:
1. Explain the reason for and correctly perform a germination test for maize when provided with seed and other appropriate materials. The test should be carried out with no errors
TRAINEES: 15 Irrigation water users Leaders (contact farmers)
TOTAL BUDGET: ETB 500.00

REQUIREMENTS

Day/Time	3 hours
Visual Aids: Handouts Flipcharts To be prepared in advance	Demonstration materials: Maize seed (2 kg) Cotton Cloth (2 sq.m) or blotting paper Saucers or Petri dish (7) Some water One saucer or Petri dish with seed already germinated (prepared 5 days before)

LESSON OUTLINE

Key Technical Information	Training/Assessment Method	Training Aids
1. Introduction to germination test: What it is and how it is useful?	Mini-lecture	Flipcharts
2. Procedure for carrying out test: a) sampling b) count 100 seeds c) arrange on cloth on rows d) apply water and store e) wait 5 days f) count germinated seeds g) calculate germination rate	Method demonstration Skill practice in group of 3	Handout Demonstration materials
3. Conclusions to be drawn from the results of germination tests	General discussion	
4. Summary	Mini-lecture Question and answers	Flipchart
5. Evaluation and follow-up	Structured format or discussions	

Annex C. Monthly Progress reporting format

ዕዝል 3: የመስኖ ልማት ኤክስቴንሽን አገልግሎት ወርሀዊ የመስኖ ልማት ሰራገኞች የሥራ ቅደምተከተል/መርሀ ግብር/

ሳምንት	ተግባራት	ዝርዝር
1ኛ ሳምንት	- የወረዳ መስኖ ልማት ፅ/ቤትና አጋር አካላት ወርሃዊ ስራዎች ላይ የጋራ መገባበት ኦረነቴሽን / ስልጠና - አገልግሎቶችን መደገፍ - የሥራ ላይ ስልጠና - የውሃ ተጠቃሚ ንዑስ ቡድኖች ጋር ውይይት ማድረግ	1. ወቅታቂ የመስኖ ልማት ኤክስቴንሽን ቁልፍ ተግባራ/ስራዎች ላይ ከወረዳና የመስኖ ልማት አጋር አካላት ጋር የጋራ መግባበት 2. ለመስኖ ውሃ ተጠቃሚዎች ማህበር ተቋማዊ የድጋፍ አገልግሎት መስጠት 3. 25 % የሚሆነውን የመስኖ ማሳዎች ቦታ መጎብኘት (ሁለት የመስኖ ብሎኮችን)ና ፣ ለውሃ ቡድን መሪዎች (አገናኝ ገበሬዎች) እና የሥራ ላይ ስልጠና/ሙያዊ ድጋፍ መስጠት 4. የመስኖ ውሃ ተጠቃሚዎችን ጋር ውይይት ማድረግ፣ ለችግሮች መፍትሄ መስጠት ወዘተ
ቅዳሜና እሁድ የበዓል ቀናት		
2ኛ ሰምንት	ተግባራት	ዝርዝር
	- ሠርቶ ማሳያ መደገፍ - አገልግሎቶችን መደገፍ - የሥራ ላይ ስልጠና - የውሃ ተጠቃሚ ንዑስ ቡድኖች ጋር ውይይት ማድረግ - የቢሮ ሥራ፣	1. የመስኖ ልማት ሠርቶ ማሳያዎችን ማለትም የሰብል ሠርቶ ማሳያዎች፣ አሳታፊ የቴክኖሎጂ ልማት፣ የማከማቻ ሠርቶ ማሳያዎች ወዘተ --አፈጻጸምን መከታተል 2. 25 % ሁለተኛውን የመስኖ ማሳዎች ቦታ መጎብኘት (ሁለት የመስኖ ብሎኮችን)ና ፣ ለውሃ ቡድን መሪዎች (አገናኝ ገበሬዎች) እና የሥራ ላይ ስልጠና/ሙያዊ ድጋፍ መስጠት 3. የመስኖ ውሃ ተጠቃሚዎችን ጋር ውይይት ማድረግ፣ ለችግሮች መፍትሄ መስጠት ወዘተ 4. ለመስኖ ውሃ ተጠቃሚዎች ማህበር ተቋማዊ የድጋፍ አገልግሎት መስጠት
ቅዳሜና እሁድ የበዓል ቀናት		

	ተግባራት	ዝርዝር
3ኛ ሳምንት	- የቢሮ አገልግሎት መስጠት - የሥራ ላይ ስልጠና - ሠርቶ ማሳያ - የውሃ ተጠቃሚ ንዑስ ቡድኖች ጋር ውይይት ማድረግ - የቢሮ ሥራ፣	1. የቢሮ ሥራ፣ ከቀበሌ አስተዳደር ሠራተኞችና መስኖ ውሃ ተጠቃሚዎች እነዲሁም ድጋፍ አገልግሎት ሰጪዎች ጋር መገናኘት 2. የመስኖ ልማት ሠርቶ ማሳያዎችን ማለትም የሰብል ሠርቶ ማሳያዎች፣ አሳታፊ የቴክኖሎጂ ልማት፣ የማከማቻ ሠርቶ ማሳያዎች ወዘተ --አፈጻጸምን መከታተል 3. 25 % ሁለተኛውን የመስኖ ማሳዎች ቦታ መጎብኘት (ሁለት የመስኖ ብሎኮችን)ና ፣ ለውሃ ቡድን መሪዎች (አገናኝ ገበሬዎች) እና የሥራ ላይ ስልጠና/ ሙያዊ ድጋፍ መስጠት 4. የመስኖ ውሃ ተጠቃሚዎችን ጋር ውይይት ማድረግ፣ ለችግሮች መፍትሄ መስጠት ወዘተ 5. ለመስኖ ውሃ ተጠቃሚዎች ማህበር ተቋማዊ የድጋፍ አገልግሎት መስጠት
ቅዳሜና እሁድ የበዓል ቀናት		
4ኛ ሳምንት	ተግባራት	ዝርዝር
	- የቢሮ አገልግሎት መስጠት - የሥራ ላይ ስልጠና - ሪፖርት ማዘጋጀትና ግበረ መልስ መስጠት - የውሃ ተጠቃሚዎችን የስልጠና ዕቅድ ማዘጋጀት፣ - መረጃ ማሰባሰብ፣ - በቀበሌ ስብሰባን መከታተል ወይም በልዩ የኤክስቴንሽን ጉዳይ ላይ መሳተፍ	1. የቢሮ ሥራ፣ ከቀበሌ አስተዳደር ሠራተኞችና መስኖ ውሃ ተጠቃሚዎች እነዲሁም ድጋፍ አገልግሎት ሰጪዎች ጋር መገናኘት 2. የመስኖ ሠርቶ ማሳያዎችን ማለትም የሰብል ሠርቶ ማሳያዎች፣ አሳታፊ የቴክኖሎጂ ልማት፣ የማከማቻ ሠርቶ ማሳያዎች ወዘተ --አፈጻጸምን መከታተል 3. 25 % ሁለተኛውን የመስኖ ማሳዎች ቦታ መጎብኘት (ሁለት የመስኖ ብሎኮችን)ና ፣ ለውሃ ቡድን መሪዎች (አገናኝ ገበሬዎች) እና የሥራ ላይ ስልጠና/ ሙያዊ ድጋፍ መስጠት 4. የመስኖ ውሃ ተጠቃሚዎችን ጋር ውይይት ማድረግ፣ ለችግሮች መፍትሄ መስጠት ወዘተ 5. ሪፖርት መጻፍ፣ የውሃ ተጠቃሚዎችን የስልጠና ዕቅድ ማዘጋጀት፣ መረጃ ማሰባሰብ፣ በቀበሌ ስብሰባን መከታተል ወይም በልዩ የኤክስቴንሽን ጉዳይ ላይ መሳተፍ

EVENT-1/ Work Plan Framework State how the extension activities relate to the annual work plan framework and contribute to any New Initiatives or community reactions.
EVENT-2/ Successes Highlight at least three successes for this reporting period, such as progress towards the irrigation extension objectives. For example, improvements relating to introducing new crop cultivars, irrigation scheduling and maintenance, or behavioral changes.
EVENT-3/ Progress on activities Provide a brief overview of progress at the main activity level, highlighting any areas that are well behind plan. Explain any major deviations in programming approach.
EVENT-4/Problems and Constraints Highlight any failures, problems or constraints that have affected irrigation extension progress, and describe the measures taken to respond to them.
EVENT-5/ Unexpected effects Describe any unexpected (positive or negative) consequences that have occurred because of the extension events and/ or any new opportunities that present.
EVENT-6/Learning and Sharing Describe key lessons learned, that are important to IADP or that may be of use to others. They may relate to any of the following: successes, extension strategies, challenges, surprise results, Woreda IADP management processes, or technical understanding of irrigation extension interventions.
EVENT-7/ Communications/Stories Highlight any actions or successes meriting rural communications attention e.g. positive farm radio coverage, success stories, contacts made, major events.
EVENT-8/ Future Issues/ Challenges Highlight the most significant issues/challenges ahead for the extension services, focusing on the next month, and explain how they can be addressed
EVENT-9/ Overall Assessment of progress Assess whether the extension approaches has made the expected progress against the action plan, and whether planned objectives will be achieved

Annex D. Annual Woreda Irrigation Planning Activity Form (Sample)

ዕዝል 4. ወርሃዊ የመስኖ ልማት ኤክስቴንሽን መልዕክት መማሪያ ጽሁፍ/ ወረቀት/

ወርሀዊ የተመረጡ ለውጥ የሚያመጡ ማብራሪያ ነጥቦች (የኤክስቴንሽን መልዕክቶች) ትምህርት አዘል ወረቀት

ጊዜ ከ ------ እስከ ----------(4 ሳምንታት)

የመስኖ ሰብል ስም፡- ጥቅል ጎመን

የተመረጠ የመስኖ ልማት ኤክስቴንሽን መልዕክት፡- ዘር መዝራት

ንዑስ ርዕስ፡- የዘር ጥራት

- የብቅለት ደረጃ መፈተሽ ፣ ቢያንስ 80% የብቅለት ደረጃ
- የጥቅል ጎመን የዘር ወለድ በሽታን ለመቆጣጠር ዘሩ በፈንጂሳይድ መታከም አለበት

የተመረጠ የመስኖ ልማት ኤክስቴንሽን መልዕክት፡-

- የዘር ወቅት፡
- የአዘራር ዘዴ፡-
  - የማሳ መረጣ
  - የዘር መደብ
  - መስመር
- ተግባር
  - የመስኖ ልማት ሰራተኞች ተግባር
  - የአረም ዘር መኖሩን ማጣራት
  - የብቅለት መቶኛን መፈተሽ
  - ዘሩን በፈንጂሳይድ ማከም
  - በመስመር መዝራት
- የስልጠና ማቴሪያሎች፡- ጥቁር ሰሌዳ፣ የጥቅል ጎመን ፣ ፈንጂሳይድ፣ የዘር መያዥያ ወዘተ...

#	ACTIVITY	UNIT	TARGET	BUDGET (Birr)	TIMELINE
1	Maintenance & Rehabilitation - main and tertiary canals - diversions - drainage	No. of labors (man days)			
2	Constructions - Canals - Pump house	No. of labors (man days)	30		
3	Demonstrations - crop demonstration - PTD - Irrigation equipment - Drip system - Grain storage	i) ii) iii) iv)			
4	Inputs Required - hybrid seeds (maize, vegetable) - fertilizers (urea, DAP, compost) - pesticides - diesel	(in kg) (in quintals) (in kg)			
5	Irrigation implements Type- 1 Type -2 Type – 3				
6	Trainings - Its - Irrigation experts				
7	Extension campaigns - field days - farm visits - experience tours - posters, leaflets - farm broadcast				
8	Monitoring and Evaluation				

Annex E. Important Operation in irrigation crop vale chain on selected crops

Crop/ Tomato	Practice in the chain	Adoption points / Non-negotiable points.	Estimated cost as of 2009 FY
Practice I	Site selection and Seedling preparation	Altitude:-100-1800mas Soil:- Loam, PH 5.5-7.5 T0:- 25 - 28 oc day& 10-15 oc Varity selection:- Gallilee, Shanty, Irma, Seed bed:- 1.20 X5-10M Seed: with 95% germination 250 to 300gm/ha Sawing :- row preparation with 15cm spacing and sawing Management:- Mulching, watering, weeding, Harding off, Sterilization	19,360
Practice – II	Land preparation.	Site selection: - Select land free from solanaceae family Tillage: - Ploughing 3-4 times with 20-30cm depth. Land leveling and ridging.	9,050
Practice III	Planting	Seedling- Prepare seedling with 3-4 true leaves 28 to 35 day age and 12-15cm length. Pre planting- Row making and Pre watering. Spacing:- 100cm b/n row and 30cm b/n plant Fertilizer application Rate: 242kg NPS at time of planting	6000
Practice-IV	Management	Weeding: - Twice after 2-weeks, after transplanting and before flowering Fertilizer/UREA/:-1st split 40kg UREA three weeks after planting. 2nd split 40kg UREA applied after 45-50 days after first application Method: - UREA side dressed 5-7 cm away from plant Stalking/support/:- starting at time of transplanting or before flowering Mulching:- With seedless grass, and leaves Wind break: - Planting of maize and various fruit trees around farm to protect from wind, and use as Protective against intruder from insects that hurt plant Watering: - Watering is based on the crop water requirement.	39,540
Practice V	Insect and diseases pest control	Chemical control.:-Unizeb , Mancozeb , Matiko , Belu gold, Skay mayil ,=kg.3 each, and Tirasare = Mil.250 Radiyaent = Mil.250 Profit =Lit .1, , Aligater = Lit 1t per hectare is needed	14.270

Crop/ Tomato	Practice in the chain	Adoption points / Non-negotiable points.	Estimated cost as of 2009 FY
Practice VI	Harvesting	Determine maturity time:- Determine maturity based on market location and demand If the market is nearby determine to harvest when the fruit is completely red If the market is far collect when the fruit turn to be red. Harvest, 1st, 2nd, 3rd, 4th 5th, 6th and the last. Total harvest if operation pass through above practices =800 qu/ha	25,600
Practice VII	Selling	Sell at farm gate :- price per quintal = 700 Total Quintal = 800 Total Revenue =800*700= 560,000 Total cost = 167,960 Marginal profit= 329,040	

Annex F:- Cost benefit analysis of selected irrigated crop (Sample)

Crop/ Potato	Practice in the chain	Adoption points / Non-negotiable points	Estimated cost as of 2009 FY
Practice I	Site selection and seed preparation /Variety selection/	Altitude:-1800-2600mas Soil:- sandy soil Soil composition:- 2:1:1 Seed- Productivity with 350-450 qu/ha:- Belete, Gudane, Jalane, Miliki,Moti, Dagm, Dancha,Ararsa, Gabisa, Gora bela, Badhasa, Dagm	12,800
Practice – II	Land preparation.	Site selection: - Select land with which free from Its family in the last three years. Tillage: - Ploughing 2-3 times with 20-30cm depth.	9080

Crop/ Potato	Practice in the chain	Adoption points / Non-negotiable points	Estimated cost as of 2009 FY
Practice III	Planting	Seed Sowing:- Pre planting: - Row making and Pre watering. Seed Rate :- For food 18-20qu/ha For seed 20-22qu/ha Spacing:- For food 75X30cm b/n row and plant respectively For seed 60X20 cm b/n row and plant respectively. Fertilizer application Rate: 240kg NPS and 55kg UREA At time of planting. Method:- 5-7cm placed apart from the seed	6000
Practice-IV	Management	Weeding: first weeding at the time of first split application of UREA and the second weeding is near to flowering. Fertilizer/UREA/:-t 2ndsplit 55kg UREA applied after 2 weeks after planting. 3rd split 55kg at the time of flowering Watering: Watering is based on crop water requirement	42,315
Practice V	Insect and diseases pest control	Chemical control Mancozeb = kg.3 Rod mil =kg.2 Matiko =kg.4, Profit =lit 3 Selekiron = lit 3/ha is required	7,060
Practice VI	Harvesting	Determine maturity time:- Determine maturity When the leaves totally dry When the leave Care should be taken at time of harvest not to damage seeds Total harvest if operation pass through above practices =450qu/ha	6,400
Practice VII	Selling	Sell at farm gate :- price per quintal = 400 Total Quintal = 450 Total Revenue =450*400= 180,000 Total cost = 83,655 Marginal profit= 96,345	

Annex G. Job Analysis worksheet (sample) Blank worksheet

BLANK WORKSHEETS

Job Analysis Worksheet

Job _____

ACTIVITY AREA	Frequency Performed (A)	Importance (B)	Learning Difficulty (C)	Total

Legends:

(A)	(B)	(C)
1 = seldom	1 = marginally important	1 = easy
2 = occasional	2 = moderately important	2 =moderate difficult
3 = weekly to monthly	3 = extremely important	3 = very difficult
4 = daily to weekly		4 = extremely difficult
5 = daily basis		

Annex H. Task breakdown worksheet (sample)

Task Breakdown Worksheet

Job _____

Activity Area _____

TASKS	Frequency Performed (A)	Importance (B)	Learning Difficulty (C)	Total

Legends

(A) (B) (C)

1 = seldom 1 = marginally important 1 = easy

2 = occasional 2 = moderately important 2 = moderate difficult

3 = weekly to monthly 3 = extremely important 3 = very difficult

4 = daily to weekly 4 = extremely difficult

5 = Daily

Annex I. Action/ step listing worksheet (Sample)

Action/Step Listing Worksheet

Job _____

Activity Area _____ Task _____

ACTION		STEPS		

Legend: (A) (B)

1 = marginally important 1 = easy

2 = moderately important 2 = moderately difficult

3 = extremely important 3 = very difficult

4 = extremely difficult

Annex J. Action Analysis worksheet (sample)

Action Analysis Worksheet

Job _____

Activity Area _____

Task _____

ACTION	Importance (A)	Learning Difficulty (B)	Total

Legend:

(A)

1 = marginally important

2 = moderately important

3 = extremely important

(B)

1 = easy

2 = moderately difficult

3 = very difficult

4 = extremely difficult

Annex K. Step Analysis worksheet (sample)

Step Analysis Worksheet

Job _____

Activity Area _____

Task _____

Action _____

Step	Learning Difficulty

Legend: 1 = easy
2 = moderately difficult
3 = very difficult
4 = extremely difficult

Annex L. Sample Gap Analysis (Task) format

Job: Vegetable Farmer

Activity Area: Pest and disease control

(Score) Tasks	Proficiency rating 1 2 3 4 5 (see legend below)	✓ yes or X no for proficiency	Can the problem be addressed by training? ✓ yes, or X no

Legend: 1 = cannot complete any part
2 = can complete less than half the task
3 = can complete more than half but less than the total
4 = can complete the entire task but takes too long
5 = can complete the task accurately and efficiently.

Annex M. Sample Gap Analysis worksheet (Actions) format

Job: Vegetable Farmer

Activity Area: Past and disease control

Task: Using a knapsack sprayer

(Score) Actions	Proficiency rating 1 2 3 4 5 (see legend below)	✓ yes or X no for proficiency	Can the problem be addressed by training? ✓ yes, or X no

Legend: 1 = cannot complete any part

2 = can complete less than half the steps required

3 = can complete more than half but less than the total

4 = can complete the entire steps but takes too long

5 = can complete all the steps accurately and efficiently.

Annex N.sample Gap Analysis sheet (Tasks) format

Job _____

Task _____

(Score) Tasks	Proficiency rating 1 2 3 4 5 (see legend below)	✓ or X for	Can the problem be addressed by training? ✓ yes, or X no

Legend: 1 = cannot complete any part of the task

2 = can complete less than half the task

3 = can complete more than half but less than the total

4 = can complete the entire task, but takes too long

5 = can complete the task within the time standard.

Annex O. Sample Gap Analysis worksheet (Actions) format

Job _____

Activity Area _____

Task _____

(Score) Actions	Proficiency rating 1 2 3 4 5 (see legend below)	✓ yes or X no for proficiency	Can the problem be addressed by training? ✓ yes, or X no

Legend: 1 = cannot complete any part of the task

2 = can complete less than half the task

3 = can complete more than half but less than the total

4 = can complete the entire task, but takes too long

5 = can complete the task within the time standard

Annex P.Example of Monitoring and Evaluation Plan Achievement impact, outcome, output and input of activity of verification

Information Requirements	Indicators	Means of verification				use of information	
		Data source	Frequency of collection	Responsibility of data collection	Collection method	Reporting	Presentation
Impact/ Goal							
Outcome/ Purpose							
Output							
Activity							
Input							

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